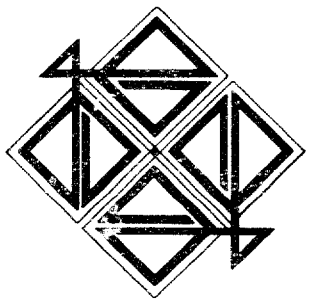
Human Resources for Agriculture and Rural Development in Pakistan
1984 - 1993

A Survey of Ten Years of Training Sponsored by the United States Agency for International Development in cooperation with the Government of Pakistan

With particular reference to Overseas Training



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In cooperation with the
Office of Agriculture and Rural Development
U.S. Agency for International Development / Mission to Pakistan

Abbreviations & Acronyms

Government of Pakistan

AARI	Ayub Agricultural Research Institute
AEARC	Atomic Energy Agricultural Research Center, Tando Jam
AZRI	Arid Zone Research Institute
CEWRE	Center of Excellence in Water Resources Engineering, Lahore
DRIP	Drainage and Reclamation Institute of Pakistan
FATA	Federally Administered Tribal Areas
FBS	Federal Bureau of Statistics
GOP	Government of Pakistan
IWASRI	International Waterlogging and Salinity Research Institute, Lahore
MINFA	Ministry of Food, Agriculture, and Cooperatives (also, MINFAC)
MINFAC	Ministry of Food, Agriculture, and Cooperatives (also, MINFA)
MUET	Mehran University of Engineering and Technology, Jamshoro
MOST	Ministry of Science and Technology
NARC	National Agriculture Research Center
NIAB	National Institute of Agriculture and Biology
NIBGE	National Institute for Biotechnology & Genetic Engineering
PARC	Pakistan Agricultural Research Council
PASSCO	Pakistan Agricultural Supplies and Storage Company
PCRWR	Pakistan Council for Research in Water Resources
PFI	Pakistan Forest Institute
PSF	Pakistan Science Foundation
SAU	Sindh Agricultural University, Tando Jam
SFD	Sindh Forest Department
WAPDA	Water and Power Development Authority

United States Agency for International Development

ACE	Agricultural Commodities and Equipment Program
ARD	Agriculture and Rural Development
ASSP	Agriculture Sector Support Program
BALAD	Balochistan Area Development
F/FRED	Forestry/Firewood Resources and Development Project [USAID]
FP&D	Forestry Planning and Development
FSM	Food Security Management
ISM	Irrigation Systems Management
MART	Management of Agricultural Research and Technology
NWFPAD	NWFP Area Development
OFWM	On-Farm Water Management
TAD	Tribal Areas Development
TIPAN	Transformation and Integration of the Provincial Agricultural Network
USAID	United States Agency for International Development

Other International Institutions and Programs

ACIAR	Australian Centre for International Agricultural Research
CIDA	Canadian International Development Assistance
CIMMYT	International Maize and Wheat Improvement Centre
FAO	United Nations Food and Agriculture Organization
FORSPA	Forestry Research Support Programme for Asia and the Pacific
IPTRID	International Programme for Technology Research in Irrigation & Drainage
UNDP	United Nations Development Programme

Credits

This report was produced by the Follow-Up Unit of the AED DSTP office in Islamabad, with assistance from the Participant Training and Administrative Units. Credits for data set production go to Tahir Mahmood for pages 6, 8-9, 11-12; Asif Javed, pages 14-15, 18-19; and M. Sarfraz Mirza, pages vii-x, 20-24. Annexes were compiled by S. Mahmud Ahmad, Irene Bowers, Asif Javed, and M. Sarfraz Mirza.

Introduction

In December, 1983, the United States Agency for International Development (USAID) contracted AED to provide technical assistance to the Agency's Mission to Pakistan in implementation of a diversified initiative in human resources development entitled the Development Support Training Project (DSTP). DSTP was designed to strengthen local professional cadres through in-country training and a Thomas Jefferson Fellowship Program.[1]

In the intervening ten years, DSTP has arranged training for over 10,000 Pakistani professionals, in Pakistan and abroad. Of more than 6000 who received training outside Pakistan, approximately half were funded by DSTP and half by 21 Mission projects and programs subscribing to DSTP's placement and administrative services.[2] In view of DSTP's command of programmatic, financial, and biographical information related to this training, the project was requested in 1991 to report on the Pakistan Mission's overseas HRD efforts during the period. The present report, focusing on overseas training sponsored by the Mission's Office of Agriculture and Rural Development, is a part of this undertaking; in terms of numbers of training beneficiaries it covers one-third of Mission-supported overseas trainees during the past ten years.

The authors are indebted to many individuals in the Government of Pakistan, the USAID Mission, and the private sector for giving generously of their time to comment on USAID-supported training. Among USAID colleagues, we would like to thank particularly Dr. Abdul Quyyum, Ahmad Jameel, Jalil Ahmad, Khwaja Hameedullah, Dr. Muhammad Khalid, and Dr. Zakir Hussain Rana, who accompanied us on information-gathering visits to beneficiary organizations; they, as well as John Swanson, Dr. Lois Bradshaw, and Dennis Weller, **Foreword** author, provided valuable input to the report.

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1. USAID's Thomas Jefferson Fellowship Program supports human resources development through long-term (academic, degree-targeted) and short-term (technical, non-degree) training in the United States or a country other than that of the trainee. Long term trainees are referred to as Jefferson Fellows; short-term, as Jefferson Associates. For convenience, Fellows and Associates are commonly referred to as *participants* and the Jefferson program, as the *participant training program*. Training which takes place outside the United States and the cooperating country is referred to as *third-country training*.

2. One Mission project remained outside the DSTP "buy-in" arrangement---Transformation and Integration of the Provincial Agricultural Network (TIPAN), which focused on the development of the NWFP Agricultural University and related provincial research and extension services. TIPAN is implemented with technical assistance from the University of Illinois, Urbana-Champaign, and the Southern Illinois University, Carbondale. Semi-annually, TIPAN provides DSTP with statistics on TIPAN training, permitting, through DSTP, Mission-wide reporting on participant training.

In addition, we wish to thank the following:

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Rukhsana Malik and Salma Bano, Research Officers at the Department of Planning and Development; Zaheer Uddin Shaikh, Director General of Agricultural Research, and Khalil-ur-Rehman, Deputy Director (Research), Agriculture Research Institute, Quetta; Pir M. Achakzai, Project Director, Department of Agriculture; Mohammad Anwar Sheikh, Research Officer, Veterinary Research Institute; Syed Hassan Raza, Principal Scientific Officer, Arid Zone Research Institute, Quetta, and colleagues M. Islam, Zahid Ali Qurayshi, M. Anwar Khan, and Dr. Sarwat N. Mirza; Abdus Salam Khan, Chief Engineer, Irrigation and Power Department, and colleagues Abdul Qahir, Khuda Dad Khajjak, Munawar Khan Mandokhel, and Nadir Ali.

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In NWFP

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In Islamabad

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Finally, we would like to express our appreciation to fellow technical assistance contractors, Dr. Oval Myers, Jr., Team Leader, TIPAN Project, and Dr. Charles R. Hatch, Chief-of-Party, Winrock International.

We hope the present report does some justice to this important contribution to professionalism in agriculture and rural development in Pakistan.

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Summary

USAID will conclude activity in Pakistan as of mid-1995, bringing to a close, if only temporarily, a relationship of over forty years, peaking during 1984-1993 in a decade of bilateral development cooperation exceptional in its scale and diversity.

Of approximately $2b of joint funding projected to be invested in Pakistan's development during the period 1980-1995, half has already been invested in the agricultural sector, reflecting Pak-US recognition of the critical importance of agriculture and agribusiness in Pakistan's development.

Two programs and nine projects, most operating concurrently during the last ten years, have significantly enhanced and extended local capabilities in education and training, scientific research, and resources management. Of these 11 initiatives, ten have included human resources development components.

The present report focuses on the overseas training supported by these undertakings: disaggregating data on over 2000 beneficiaries and their training; analyzing participant feedback; profiling beneficiary institutions; and offering lessons learned by managers and administrators. An annex to the report provides information on USAID-supported doctoral recipients and candidates in agriculture, including the research focus of each as reflected in his or her doctoral dissertation title. Notes on in-country training are also provided, as well as a foreword placing the present HRD effort in the context of broader sectoral development and the history of Pak-US cooperation.

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By mid-1995, over 2200 Pakistani professionals will have completed overseas training under the latest generation of Pak-US initiatives in agriculture and rural development; 550 will have received graduate degrees (378 master's and 172 doctorates).

To date, 86% of all beneficiaries have been from the public sector and 98% have been men. Ninety-three percent of overseas trainees, and 98 percent of training time, were based in the United States. The majority of US-based training took place in six states, while the remainder was scattered among another 39 states and the District of Columbia. State universities predominated among US-based training providers. Ninety-one percent of projected training has been concluded and 91% of projected trainees have returned to Pakistan.

Feedback from hundreds of returned beneficiaries and officials of 18 employer-institutions contacted by AED follow-up staff has been overwhelmingly positive, reflecting, in the great majority of cases, satisfaction with placement and enhanced capabilities both at personal and organizational levels.

Fifty-nine public sector institutions sent four or more employees for training and accounted for 80% percent of public sector participants; five organizations each sent over 90 employees, while half ranged between 10 and 50. Eleven of these 59 institutional beneficiaries specialize in education and training; 16, in scientific research; and 32, in resource management. Opportunities for academic training were shared more or less equally among the three functional areas, while resource-management professionals predominated among technical trainees.

As measured by number of employee-beneficiaries, NWFP Agricultural University and the affiliated Agricultural Research Institute at Tarnab (institutional focuses of the TIPAN Project) were the main beneficiaries in education and in scientific research respectively; similarly, the University of Faisalabad was a major educational beneficiary, as were the Food & Agricultural Division of MINFAC and the Irrigation and Power Department, Punjab, among resource management institutions.

The final chapter of the report takes up a number of suggestions as to how HRD planners and managers can enhance the likelihood that qualified people get developmentally important training, that their skills are invested and nurtured, that professional networking is facilitated, and that the effectiveness and importance of HRD is assessed and communicated.

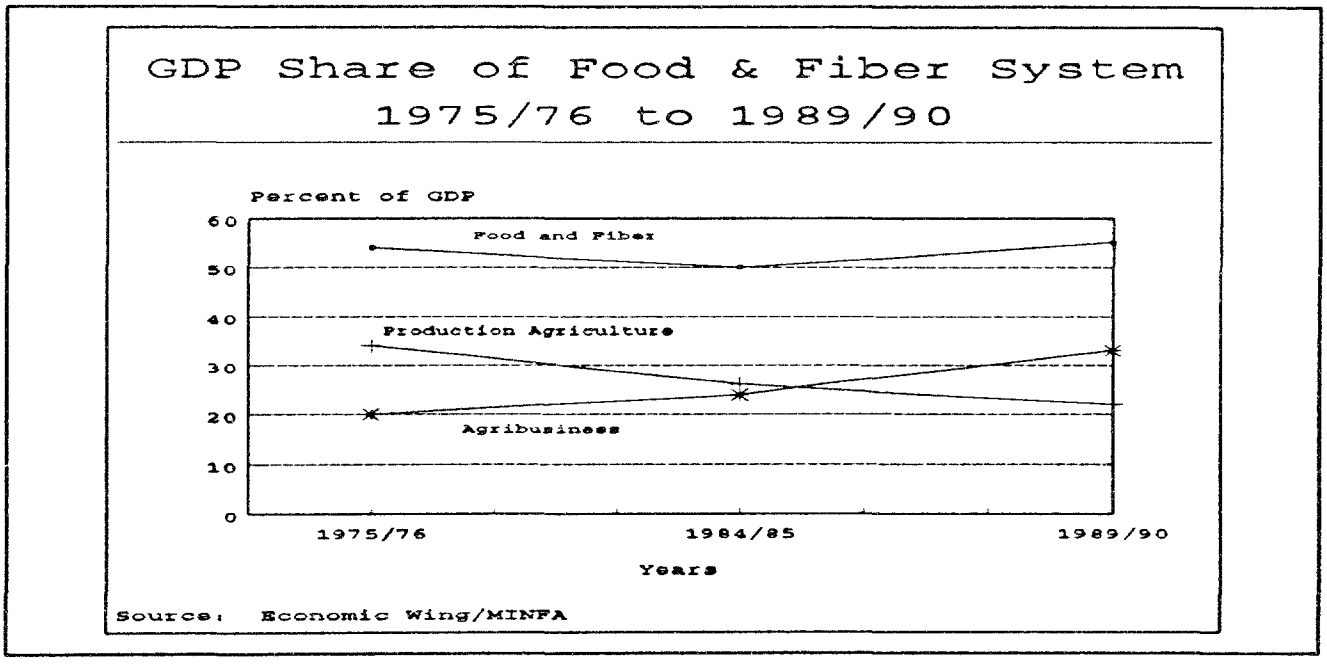
As organizations mature and professionalism spreads, practices such as training needs assessment, merit-based selection of training candidates, and guarantees of job continuity may be expected to become more typical features of HRD programs. Local institutions will meet a larger share of academic and in-service training requirements, enabling donor-assisted programs to focus more closely on specialized training needs to which local resources cannot respond. Freed-up donor resources may be fruitfully invested in extending information access, particularly in assisting professionals to intercommunicate nationally and internationally through specialist publications and data networks, and to stimulate dialogue among academia, government, business, and labor in support of human resources development.

Finally, donor agencies may be encouraged to undertake analysis of the longer-term impact of HRD interventions in the interest of assessing more rigorously the return on education and training as a development investment.

Foreword

Pakistan's Agricultural Economy: An Overview

Pakistan's agriculture sector, broadly defined to include agribusiness in addition to production agriculture, accounts for more than half of Pakistan's gross domestic product (GDP) and generates 70% of the nation's employment.[1] During the 15 years between 1975-1990, agribusiness's share of GDP rose from 20% to 33%, while production agriculture's contribution to GDP declined comparably (see figure below). Pakistan's exports are similarly dominated by agriculture products, mostly cotton-based goods and rice. In the near term, Pakistan's agriculture sector will continue to be the principal driving force of the nation's economy.



[1] Major components of Pakistan's agricultural sector are food processing, cotton-based manufacturing, storage and transportation of agricultural end-products, and wholesale and retail agro-based trade.

The United States Agency for International Development (USAID) has provided Pakistan almost $8 billion in economic assistance during the period 1952-1993. Agriculture, because of its overwhelming importance to Pakistan and its people, has been a cornerstone of Pak-U.S. cooperation.

U.S. bilateral assistance prior to 1980 produced significant results in the areas of civil works, policy, and institution building. In the post-independence period, Pak-U.S. cooperation focused on rehabilitation and expansion of infrastructure creating the conditions for accelerated agricultural growth. In particular, Pakistan's irrigation system--begun in the mid-19th century and today the most extensive in the world--required substantial investment both to increase its efficiency and to establish its independence in the wake of water division agreements with India. Second, increased U.S. PL 480 wheat sales and related Pakistani price supports for agriculture commodities beginning in the late 1950s created a favorable environment for adoption of subsequent breakthroughs of the 'green revolution'. Third, a number of USAID-supported technical assistance projects gave significant impetus to the establishment of agricultural education and research institutions which continue today as highly-regarded, self-sustaining entities. Among institutions assisted in the 1950s and 1960s, were the Agriculture Universities at Faisalabad and Mymensingh (now in Bangladesh). Many of the current senior administrators, faculty members, and researchers in these and other public sector, agricultural institutions received, with USAID backing, higher degrees in the United States during this era.

Irrigation and drainage activities have been a staple of Pak-U.S. cooperation from the beginning. The largest and best known of these was the $2.5 billion Indus Basin Project, which also included other donor support. In addition, USAID-supported investments in the development and adoption of 'green revolution' technologies, including fertilizer, seed, and small scale machinery, produced lasting change in agricultural practices and increases in productivity. In the early 1970s USAID supported development of federally coordinated research programs for major commodities, construction of a national agricultural research center (NARC), and research-related technical assistance, training, and equipment. Parallel, USAID-supported, extension activities stimulated adoption of new high-yielding technologies developed by the national research system.

The 1980s ushered in a new generation of large-scale USAID assistance, with agriculture claiming close to 60%, or just under $1.2 billion, of a $2b portfolio of programs and projects to be concluded in 1995. USAID/Pakistan's development strategy during the 1980s and 1990s recognized the importance of the sector and the expectation that the greatest potential returns lay in the areas of irrigation and drainage, technology generation, policy change, institution building, forestry and agribusiness. **Basic information on the latest generation of Mission projects and programs in agriculture and rural development is provided at the end of the foreword.**

Because of Pakistan's attention to agriculture, partially funded by international donors but mostly from Pakistan's own resources, annual agriculture production growth rates have doubled over the past three decades. This growth has been led in recent years by the

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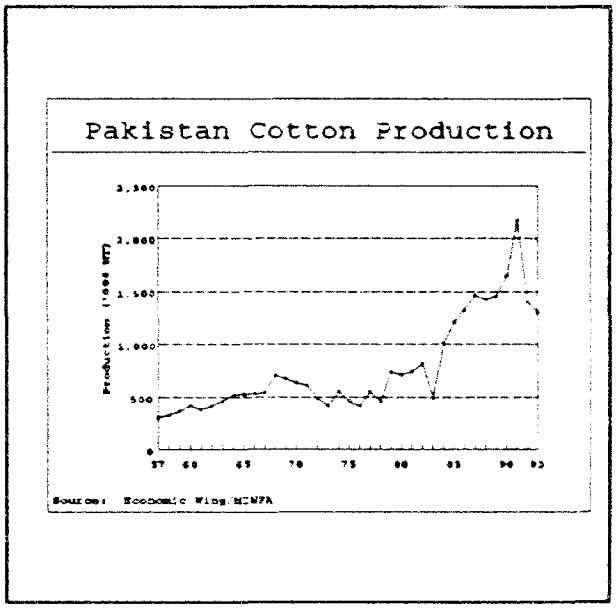
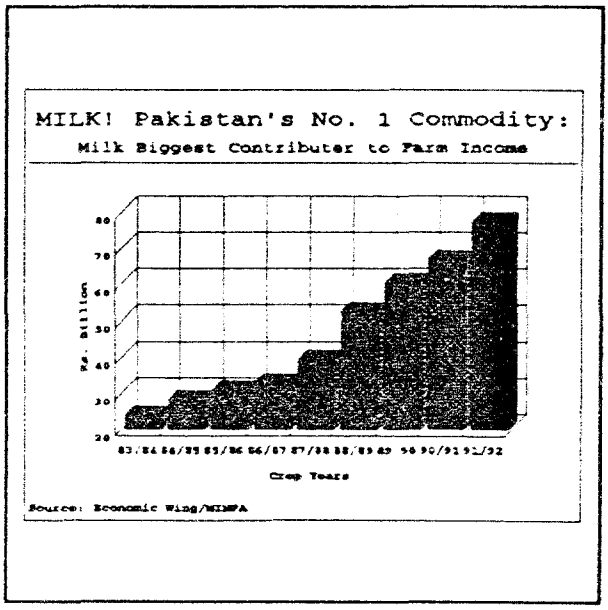
i Human Resources for Agriculture and Rural Development, 1984-1993

cotton and livestock sub-sectors. Pakistani cotton production, which historically has recorded some of the highest yields in the world, provides the raw material for a thriving textile industry, employing a significant number of people and accounting for the majority of export earnings (see figure below left). The value of milk and milk products, constituting nearly one-third of the national food bill, has more than tripled in the past decade; indeed, milk is Pakistan's number one commodity (see figure below right).





Strides in production have fueled the rapidly growing agribusiness sector. The agricultural sector is producing an increasing saleable surplus that is supporting sustained economic growth and the transition to a more market-oriented economy. It has allowed Pakistan's exports, mostly cotton-based, to expand, nutrition to improve and poverty to decline. Indeed, the dynamism of Pakistan's agricultural sector has been and will continue to be critical to the growing economic prosperity of the nation as a whole.

But major challenges remain. Despite impressive gains in a few areas, Pakistan's agriculture remains characterized overall by relatively low productivity, weak marketing and credit systems, deteriorating soils and water quality, and shortage of water for irrigation. Wheat production is increasing at two percent a year, while annual population growth is currently running at over three percent. The widening gap between production and consumption means more wheat imports for an already foreign exchange-short country. A drastic decline in cotton output in 1992-93 reflects the vulnerability of this major sub-sector to diseases, pests, and natural disasters.

Nonetheless, the potential for more rapid agricultural growth exists, and not to capitalize on the potential will have serious implications for the people of Pakistan. The next generation of increases, however will not come from expanding land area, applying more fertilizer, or building more irrigation infrastructure; rather it will come from better management, value-added agribusinesses, and improved technologies to boost productivity. Improving water efficiency, exporting value-added agriculture products to sophisticated markets, or transporting bulk commodities with efficient, modern systems

are examples of the new directions in which innovation will be required. The USAID partnership with Pakistan has encompassed these and other productivity-increasing technologies in recent years.

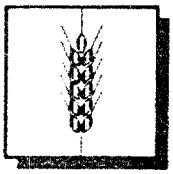
Key to all these investments has been and will continue to be improvement of Pakistan's human capital. Over the past forty years, approximately 5,500 Pakistani agricultural professionals have been beneficiaries of USAID-supported training abroad. 2,300, or over 40% of these undertook training since 1984; in the same timeframe, many more have been beneficiaries of in-country training supported by USAID. The present report provides a variety of perspectives on the last ten years of Pak-US cooperation in human resources development for agriculture and rural development, which should be of interest both to HRD planners and agricultural professionals. Staff of the Mission to Pakistan's Agriculture and Rural Development Office are pleased to have been involved with the Academy for Educational Development in the production of the report and wish to express our appreciation to Government of Pakistan colleagues and Mission technical assistance staff who also provided input.

Investing in people has played a major role in Pakistan's economic development and will continue to do so as the country progresses into the next century.

Dennis Weller, Chief
Agricultural Sustainability Policy and Production
USAID Mission to Pakistan

ARD Projects and Programs, 1982-1995

Agriculture



TRANSFORMATION & INTEGRATION OF THE PROVINCIAL AGRICULTURAL NETWORK Project 0488 : 08/84 - 08/94 Funding 55.5 m

GOAL Increase NWFP's agricultural yields, agricultural production, farm income and rural employment; secondarily, to transform the agricultural technology transfer network in the NWFP.

PURPOSE Integrate agricultural research in the Northwest Frontier Province (NWFP) with agricultural education at the University level, improve the quality of education offered and research undertaken by the University, and strengthen linkages with agricultural extension through a problem-solving, farmer-oriented outreach program.

AGENCIES NWFP Agricultural University (NWFP/AU); University Grants Commission.

MANAGEMENT OF AGRICULTURAL RESEARCH & TECHNOLOGY Project 0489 : 08/84 - 08/94 Funding 33.0 m

GOAL Improve the income of small farmers, sustain an increase in food and fibre production and conserve the natural resource base.

PURPOSE

1. Develop and disseminate improved technology and information through key institutions; and,
2. Foster a collaborative relationship whereby research institutions serve private agribusiness and farmers and use the private sector to disseminate marketable, improved technologies.

AGENCIES Pakistan Agricultural Research Council (PARC); National Agricultural Research Center (NARC); Arid Zone Research Center (AZRI); Agricultural Research Institutes (ARI) at Faisalabad, Sariab and Tando Jam; Sindh Agricultural University; Agricultural University at Faisalabad (AUF); and the NWFP Agricultural University (NWFP/AU).

FOOD SECURITY MANAGEMENT Project 0491 : 08/84 - 06/91 Funding 32.779 m

GOAL Achieve the food security objectives of the GOP in a manner consistent with the rational and efficient use of national resources, overall economic development of the country, and an improved standard of living for farm families and the population at large.

PURPOSE Improve the analytical and the physical capacity of the GOP to manage the national food security system effectively and efficiently.

AGENCIES Ministry of Food, Agriculture and Cooperatives, GOP, Islamabad; Federal Bureau of Statistics, GOP, Islamabad; University of Agriculture, Faisalabad; and all the four Provincial Food Departments.

ARD Projects and Programs, 1982-1995, continued

AGRICULTURAL SECTOR SUPPORT **Program 0492 : 09/87 - 03/95** **Funding 211.0 m**

GOAL Sustain economic growth in Pakistan through increased productivity in the agricultural sector.

PURPOSE
1. Provide balance-of-payments support to GOP through commodity imports and sector grants.
2. Remove key constraints to increased economic growth in the agricultural sector through policy reform and expanded private sector investment and participation.
3. Strengthen the long-term capacity of GOP in market based management of the agricultural sector and assist GOP in developing the policy reform agenda.

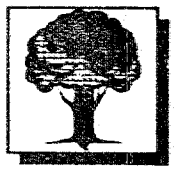
AGENCIES Ministry of Food & Agriculture (MINFA); Ministry of Finance, Economic Affairs Division (EAD) and Federal Bureau of Statistics (FBS).

AGRICULTURAL COMMODITIES AND EQUIPMENT **Program 0468 : 06/82 - 05/92** **Funding 554.0 m**

GOAL Promote the economic and political stability of Pakistan through the import of certain commodities and commodity-related services.

PURPOSE Increase productivity of the agricultural sector through the provision of needed imported commodities and equipment and provide balance-of-payments support.

AGENCIES Ministry of Food & Agriculture (MINFA); Ministry of Finance, Provincial Irrigation Departments and others.



Forestry

FORESTRY PLANNING & DEVELOPMENT **Project 0481 : 08/83 - 12/94** **Funding 27.5 m**

GOAL Help Pakistan increase its energy supplies and achieve energy self-sufficiency; secondarily, reverse the process of deforestation in Pakistan and expand the extremely limited forest resource base.

PURPOSE
1. Strengthen the capacity of federal and provincial government institutions to formulate, implement and evaluate policies and programs for increasing the production of fuel wood and timber in Pakistan;
2. Strengthen the involvement of private individuals and organizations in the production of farm forest products on private lands;
3. Demonstrate the economic, technical and social feasibility of producing tree crops on privately owned farm and range lands.

AGENCIES Office of the Inspector General of Forestry (O/IGF); Pakistan Forest Institute (PFI); Provincial Forest Departments.

Rural Development

TRIBAL AREAS DEVELOPMENT Project 0471 : 09/82 - 09/94 Funding 26.0 m

GOAL Accelerate the integration of the Tribal Areas into the socio-economic mainstream of Pakistan and improve the quality of life for tribal inhabitants.

PURPOSE Component 1 - Tribal Areas: Strengthen the capability of government institutions to plan and implement development programs in the Tribal Areas through road improvement, irrigation, agricultural/forestry development and social service facilities.

Component 2 - Sarhad: Help develop Sarhad Rural Support Corporation (SRSC) into a fully operational, financially viable, well-managed independent entity to carry out community-based development programs in the selected areas of Northwest Frontier Province.

AGENCIES Ministry of States and Frontier Regions (SAFRON); Federally Administered Trial Areas Development Corporation (FATA-DC); Government of Northwest Frontier Province (GONWFP); Departments of Communication and Works (C&W), Planning and Development (P&D), and Local Government and Rural Development (LG&RD), FATA-Agriculture and FATA-Education.

BALOCHISTAN AREA DEVELOPMENT Project 0479 : 08/84 - 06/92 Funding 29.1 m

GOAL Contribute to the socio-economic development of the lagging areas of Pakistan.

PURPOSE Improve the quality of life for people who live in the Makran through improving roads, water infrastructure, agricultural development, access to social services and strengthening Balochistan's planning, management and human resources in the process.

AGENCIES Government of Balochistan (GOB): Planning & Development (P&D); Communication & Works (C&W); Irrigation & Power.

NORTHWEST FRONTIER AREA DEVELOPMENT Project 0485 : 08/83 - 09/94 Funding 54.4 m

GOAL Eradicate opium poppy production within a process of rapid socio-economic development in the remote areas of Pakistan. With the addition of support to a drug abuse reduction center, the project is also designed to contribute to the goal of eliminating drug abuse in Pakistan.

PURPOSE Component 1 - Gadoon-Amazai: Change the area economy from one based primarily on poppy production to a diversified agricultural and non-agricultural system with strong ties to the national economy.

Component 2 - Kala Dhaka: Halt existing poppy production and prevent future increases through a development effort which combines project funding and community participation. This effort is aimed at drawing the region and its people into the national economy and recent development trends.

Component 3 - Drug Abuse Prevention Resource Center (DAPRC): Support and encourage local, provincial and national efforts to achieve a drug-free society through reduction of both drug demand and drug production; to serve as a clearinghouse for distribution of accurate information on drug abuse prevention acceptable in the Pakistani context.

AGENCIES NWFP Planning & Development: Special Development Unit; Project Coordinating Unit; Various Federal/Provincial Government Line Agencies. Regional Narcotics Education Project, Pakistan Narcotics Control Board; US Embassy Narcotics Affairs Unit.

ARD Projects and Programs, 1982-1995, continued

Water

ON-FARM WATER MANAGEMENT Project 0413 : 10/76 - 06/87 Funding 18.5 m

GOAL Increase agricultural production and improve income for low income farmers.

PURPOSE Establish public and private sector capabilities to plan and deliver on-farm water management services including watercourses improvement, precision land levelling and improvement of crop and water management practices, on an economic basis.

AGENCIES Ministry of Food and Agriculture.

IRRIGATION SYSTEMS MANAGEMENT Project 0467 : 06/83 - 12/93 Funding 121.0 m

GOAL Increase agricultural productivity and production through more efficient, reliable and equitable distribution of water.

PURPOSE Component 1 - General Institutional Improvement: Assist the four Provincial Irrigation Departments and the Federal Coordination Cell to develop the capacity for efficient management, operation and maintenance of rehabilitated irrigation systems.

Component 2 - Research: Develop national capacity for research in irrigation and drainage and assist priority research in farm water management, delivery system improvement, conjunctive use of ground and surface water, and reduction in salinity and water logging.

Component 3 - Command Water Management: Develop replicable models which result in the provincial to farm-level institutional infrastructure necessary for effective and integrated agricultural management.

AGENCIES Provincial Irrigation Departments (PIDs); Federal Flood Commission; Ministry of Water & Power.

1 Training Data

Overseas

Total Participants and Person-Months of Training

By end-1993, 2051 participants had returned to Pakistan after successfully completing USAID-supported training abroad in specializations in agriculture and rural development, since the start of new sectoral HRD initiatives in 1984. Total training, as measured in person-years, amounted to 1419.[1]

Among four sectoral subdivisions (agriculture, water, forestry, and rural development), agriculture claimed the lion's share of participants and training time, 1086 and 70%, followed by water, 727 and 23%; forestry and rural development, with 162 and 76 participants, respectively claimed 5% and 3% of total training time.

The Irrigation Systems Management Project (ISM) sponsored almost one-third of all participants. ISM, along with the Transformation & Integration of the Provincial Agricultural Network Project (TIPAN) and the Management of Agricultural Research and Technology Project (MART), accounted for 65% of total training time.

[1] Prior to closure of the USAID Mission, anticipated in 1995, an additional 200 ARD participants are expected to have completed training and returned to Pakistan, bringing the total of agriculture-sector participants for the period 1984-1995 to approximately 2250 and total training to over 1550 person-years. Of the additional returned participants, 147 are expected to earn a graduate degree, bringing the total projected degree-recipients to 550. The present report thus covers over 90% of both ARD participants and training time projected for the 12-year period.

Jefferson Fellows

403 returned participants, or one out of five, earned an academic degree: of these, 231 received a master's degree; 154, a doctorate; 18, an associate degree.[2] Close to two-thirds of all training, as measured in person-years of training, was degree-targeted.

TIPAN sponsored 99 successful graduate Fellows, including 58 doctoral degree recipients. ISM had 91 Fellows, including 13 doctorates; MART, 71 Fellows, including 60 doctorates; ASSP, 69 Fellows, including 17 doctorates.

Jefferson Associates

Over 1600 individuals successfully completed short-term, non-degree, technical training, averaging 1.2 months per participant.

ISM sponsored one-third of all technical trainees, at an average per capita duration of 1.9 months. Longest average per capita technical programs were sponsored by TIPAN, at 3.7 months, followed by ASSP, at 3 months.

Third-Country Training

152 participants, or 7% of total, undertook training in a country other than the United States or Pakistan (so-called "third countries"), amounting to 2% of total training time.[3]

The rural development initiatives Tribal Area Development (TAD) and Northwest Frontier Province Area Development (NWFPAD) were the largest users of third-country training. Sixty percent of overseas TAD training and 45% of overseas NWFPAD training took place in third countries.

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[2] The Associate Degree program was an undertaking of the Balochistan Area Development Project and complemented DSTP's Balochistan Scholarship Program which assisted an additional 47 participants to obtain Associate Degrees, reflecting the Mission's interest in priming professional development amongst the educationally-disadvantaged population of the nation's least developed province.

[3] USAID supports third-country training when comparable training in the United States or the cooperating country is unavailable. Third-country training typically deals with the study of how other governments are dealing with challenges comparable to those of the cooperating country.

Women and Men

Males represented 98% of all returned participants, reflecting the predominance of males in the sector's professional cadres.

The Agricultural Sector Support Program (ASSP) was the largest supporter of training of women, sponsoring 30 female participants, or 7% of ASSP's total participants.

Nine women, including four sponsored by ASSP and three by TIPAN, completed graduate degrees.

Public and Private Sector

Public sector participants accounted for 86% of all participants.

289 private sector participants, the remaining 14%, were beneficiaries of 11% of training time. Major supporters of private sector training were BALAD (95% of training time), ASSP (32%), and Food Security Management (FSM) (22%).

For additional information on US and third-country training, see data set 1.1 following.

1.1 US and Third-Country Training, 1984 – 1993 (a)

Sectors / Projects & Programs	All Training			Long Term Training				Short Term Traini	
	Trainees	Person Years	Person Years of Total	Post-2ndry Degree Recipients (b)	Doctoral Recipients	Master's Recipients	Person Years of Total (c)	Trainees	Avera Mont per cap
All Sectors	2051	1419	100%	403	154	231	64%	1648	1
Agriculture	1086	989	70%	265	139	126	57%	821	2
Transformation & Integration of the Provincial Agricultural Network	169	323	23%	99	58	41	*93%*	70	3
Management of Agricultural Research & Technology	275	303	21%	71	60	11	*87%*	204	2
Food Security Management	225	103	7%	26	4	22	*61%*	199	2
Agricultural Sector Support Program	417	260	18%	69	17	52	*67%*	348	3
Forestry	162	65	5%	22	2	20	3%	140	1
Forestry Planning & Development	162	65	5%	22	2	20	*71%*	140	1
Water	727	320	23%	97	13	84	2%	630	1
On-Farm Water Management	87	22	2%	6	0	6	*59%*	81	1
Irrigation Systems Management	640	298	21%	91	13	78	*71%*	549	1
Rural Development	76	45	3%	19	0	1	3%	57	1
Tribal Areas Development	16	2	0.1%	0	0	0	*0%*	16	1
Balochistan Area Development	44	41	3%	19	0	1	*89%*	25	2
NWFP Area Development (d)	16	2	0.1%	0	0	0	*0%*	16	1

Notes (a) Statistics for completed programs as of December 31, 1993.
(b) In addition to PhDs and Master's, includes 18 Associate Degree recipients, sponsored under Balochistan Area Development.
(c) Figures in italics represent percentages of project or program total.
(d) North West Frontier Province

Third Country Training			All Training				All Training				
				Female			Public	Private Sector			
Trainees	Trainees of Total (c)	Person Years of Total (c)	Male Trainees	Trainees	Long Term Trainees	Trainees of Total (c)	Sector Trainees	Trainees	Trainees of Total (c)	Person Years of Total (c)	
152	7%	2%	2004	47	9	2%	1762	289	14%	10.8%	**All Sectors**
29	1%	1%	1045	41	8	2%	821	265	13%	8.0%	Agriculture
8	*5%*	*1%*	166	3	3	*2%*	169	0	*0.0%*	*0.0%*	TIPAN
17	*6%*	*5%*	272	3	1	*1%*	268	7	*3%*	*2.9%*	MART
3	*1%*	*0.1%*	220	5	0	*2%*	189	36	*16%*	*22.2%*	FSM
1	*0.2%*	*0.1%*	387	30	4	*7%*	195	222	*53%*	*31.6%*	ASSP
27	1%	0.11%	162	0	0	0%	162	0	0%	0.00%	Forestry
27	*17%*	*2%*	162	0	0	*0%*	162	0	*0%*	*0.0%*	FP&D
54	3%	0.4%	724	3	1	0.1%	725	2	0.1%	0.02%	Water
0	*0%*	*0%*	86	1	0	*1%*	87	0	*0%*	*0.0%*	OFWM
54	*8%*	*2%*	638	2	1	*0.3%*	638	2	*0.3%*	*0.1%*	ISM
42	2%	0.08%	73	3	0	0.1%	54	22	1%	2.76%	Rural Development
9	*56%*	*60%*	16	0	0	*0%*	16	0	*0%*	*0.0%*	TAD
22	*50%*	*5%*	41	3	0	*7%*	22	22	*50%*	*94.6%*	BALAD
11	*69%*	*45%*	16	0	0	*0%*	16	0	*0%*	*0.0%*	NWFPAD

Distribution of Participants and Training in Third Countries

440 person-months of training, or 2% of all overseas training, were conducted in third countries--ie, countries other than the United States and Pakistan. Academic programs for six graduate participants constituted 44% of person-months. Third-country technical training programs averaged 1.7 months per capita.

Thai training institutions provided 42% of third-country participant-months of training, while Philippine institutions accounted for an additional 41%. Institutions in twelve other Asian, Mediterranean, and Latin American Countries, in addition to the Netherlands, accounted for the balance.

Participants trained in Thailand accounted for half of all third-country participants; the majority of participants in Thailand (47 of 79) undertook training at the Asian Institute of Technology and included one master's degree recipient. Seven of 13 participants trained in the Philippines undertook programs at the International Rice Research Institute, including two participants who completed master's degree programs and two, doctoral programs. Another participant trained in the Philippines received a PhD from the Asian Institute of Management, Manila.

Longer technical programs were characteristic of CIMMYT in Mexico, where five participants trained in programs of 5.5 months average duration. Ten participants received technical training at the International Irrigation Center in Morocco.

For additional information on training in third countries see data set 1.2 below.

1.2 Distribution of Third Country Participants and Training, 1984 - 1993

Rank Order of Countries by Number of Participants

	Name of Country	Participants	Person Months
1	Thailand	79	187
2	Philippines	13	181
3	Morrocco	11	11
4	Spain	11	9
5	Netherland	11	7
6	Italy	7	6
7	Egypt	6	1
8	Mexico	5	26
9	France	4	3
10	Mauritius	1	3
11	Indonesia	1	1
12	Yugoslavia	1	< 1
13	Argentina	1	< 1
14	Tunisia	1	< 1

Top Five Third-Country Training Providers...

by number of participants

	Institution	Participants
1	Asian Institute of Technology Thailand	47
2	International Irrigation Center Morrocco	10
3	Intl Rice Research Institute Philippines	7
4	CIMMYT Mexico	5
5	DELFT Hydraulics Netherlands	4

Distribution of Participants and Training in the United States

At the close of the reporting period, 1969 Fellows and Associates had trained, or were in training, in 45 states and the District of Columbia.

Colorado, Utah, and the District each received more than 200 participants; Idaho and California, over 100 each. Midwestern states accounted for an additional 650 plus.

The state of Illinois, with 98 participants, provided the most training, 1903 person-months, due to the high proportion of Fellows among participants received. In terms of volume of training provided, Colorado, Idaho, Mississippi, and Utah also ranked high, each with over 1000 person-months of training provided.

State universities were far-and-away the largest providers of training. Utah State University led training providers, receiving 262 participants, 99% of its state's share; Colorado State University followed, providing training for 231 participants, 79% of its state's share. These universities, as well as the state universities of Idaho, Mississippi, Oregon, Oklahoma, Iowa, and the University of Illinois---each of which provided training to 20-40 graduate participants---represent centers of faculty awareness of Pakistan's agricultural and rural development circumstances and on-going linkages with Pakistani institutions and professionals.

Training at Historically Black Colleges and Universities

In the period 1984-1993, 26 participants undertook programs at historically black colleges and universities (HBCUs), totalling 297 person-months of training.

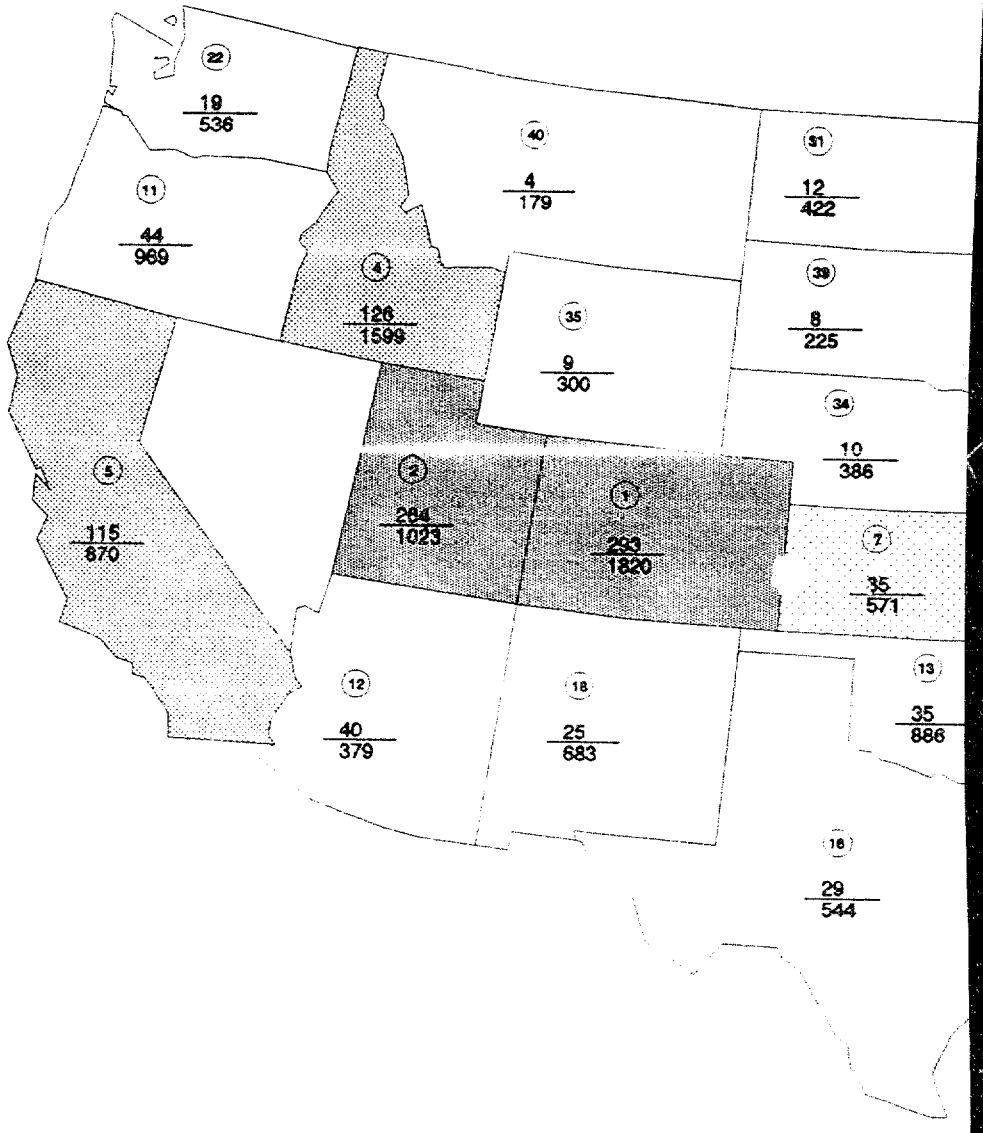
North Carolina A&T State University provided 120 person-months of training in the form of 5 master's degree programs. Tuskeegee University, Howard University, and Virginia and Alcorn State Universities were also major HBCU trainers, conducting programs for an additional three academic and nine technical participants.

For more detail on the distribution of US participants and training, see data set 1.3 following.

1.3 Distribution of Participants and Training in the United States, 1984-19

Rank order of states by number of participants: Academic and technical participants of total

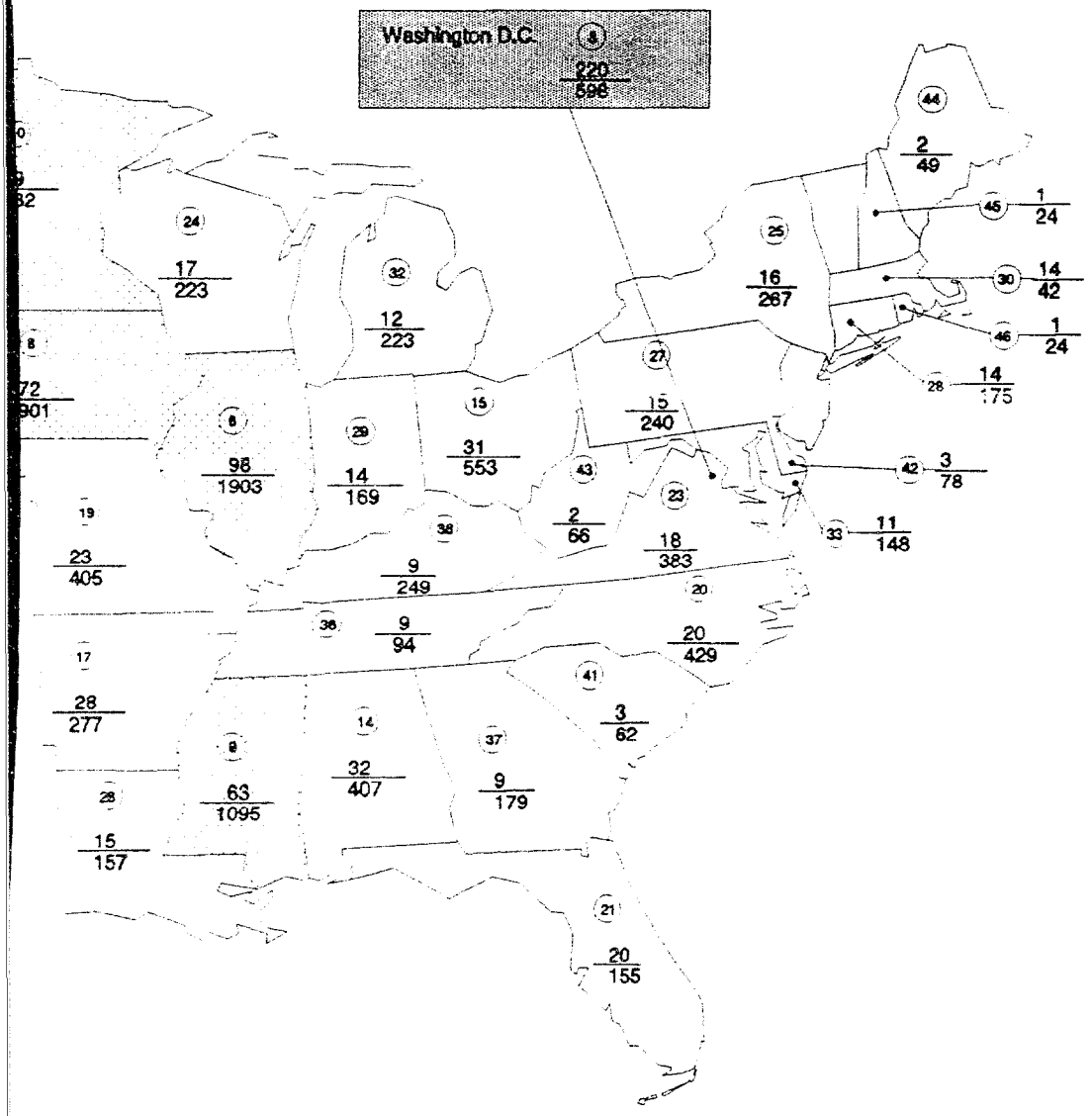
	Academic	Technical
1 Colorado	41	252
2 Utah	22	242
3 District of Columbia	4	216
4 Idaho	50	76
5 California	16	97
6 Illinois	45	53
7 Kansas	12	73
8 Iowa	21	51
9 Mississipi	32	31
10 Minnesota	8	51
11 Oregon	26	18
12 Arizona	9	31
13 Oklahoma	28	7
14 Alabama	14	18
15 Ohio	11	20
16 Texas	17	12
17 Arkansas	9	19
18 New Mexico	18	7
19 Missouri	14	9
20 North Carolina	16	4
21 Florida	5	15
22 Washington	12	7
23 Virginia	10	8
24 Wisconsin	2	15
25 New York	8	8
26 Louisiana	4	11
27 Pennsylvania	5	10
28 Connecticut	4	10
29 Indiana	3	11
30 Massachusetts	1	13
31 North Dakota	12	0
32 Michigan	5	7
33 Maryland	4	7
34 Nebraska	10	0
35 Wyoming	5	4
36 Tennessee	0	9
37 Georgia	7	2
38 Kentucky	6	3
39 South Dakota	6	2
40 Montana	4	0
41 South Carolina	1	2
42 Delaware	3	0
43 West Virginia	1	1
44 Maine	2	0
45 New Hampshire	1	0
46 Rhode Island	1	0
United States	537	1432



Number of Participants

> 200 | 100-199 | 50-99 | 0-49

$$\frac{\text{no.}}{\text{no.}} = \frac{\text{number of participants}}{\text{number of person months of training}}$$



Top Ten US Training Providers...

by number of participants

	Institution	Participants
1	Utah State University	262
2	Colorado State University	231
3	USDA/OICD *	132
4	University of Idaho	125
5	Kansas State University	80
6	Iowa State University	71
7	University of California, Davis	66
8	University of Illinois	59
9	Oregon State University	45
10	American Water Foundation	39

by number of academic participants

	Institution	Participants
1	University of Idaho	43
2	Colorado State University	36
3	Mississippi State University	29
4	Oregon State University	27
5	Oklahoma State University	24
6	Iowa State University	21
7	University of Illinois	21
8	Utah State University	21
9	New Mexico State University	16
10	North Carolina A & T St. Univ.	13

by number of technical participants

	Institution	Participants
1	Utah State University	241
2	Colorado State University	195
3	USDA/OICD *	132
4	University of Idaho	82
5	Kansas State University	71
6	University of California	64
7	Iowa State University	50
8	American Water Foundation	39
9	University of Illinois	38
10	Land O' Lakes	31

* USDA - U.S. Department of Agriculture

* OICD - Office of International Cooperation and Development

Returned Participant Feedback

857 randomly-selected, returned participants were requested to provide feedback on their overseas training experience; 318 responded.[4] Their responses are summarized in data set 1.4 following.

The overwhelming majority of respondents indicate, with a strong level of affirmation, satisfaction with training placement and post-return use and transfer of training, as well as perceived benefit to their organizations and the national development. A majority indicate that training has contributed to their professional advancement, as measured by increased income, increased responsibility, or a "better job". 86% indicated that they maintain social or professional ties made during training.

While 90% of respondents indicated colleagues and supervisors receptive to new ideas, their receptivity apparently is limited or is not universal; 34% of respondents concede some measure of truth to the assertion that they have been limited in full use of their training by a lack of receptivity to change.

To assertions that a) bureaucratic impediments, b) lack of technology, c) lack of working capital had impeded full use of training, a slight majority of surveyees, in each case, responded in the affirmative, with stronger agreement attaching to bureaucratic impediments and lack of capital than to lack of technology.

One out of three participants had moved, or been moved, into a job in which his or her training was of less relevance.

[4] DSTP's survey is in the form of an "assertionaire" comprised of 28 assertions. The surveyee is invited to respond to each assertion on a five point scale: 1-not true; 2-marginally true; 3-true; 4-very true; 5-extremely true.

1.4 Returned Participant Survey Responses

Assertion	Respondents Agreeing with Assertion	Mean Intensity of Agreement with Assertion (2- marginally true; 3- true; 4- very true; 5- extremely true)
In your judgement, placement in an appropriate training prograr. was successful.	97.5%	3.9
You have been able to use most of your training in Pakistan.	95.5%	3.3
Your training has had an impact on your enterprise (such as increased profits or better management).	84%	3.3
You feel that your training contributes to Pakistan's development.	99.1%	3.9
You have been able to introduce new ideas and concepts from USAID training to your co-workers.	97.5%	3.5
Your supervisors have been receptive to new ideas you gained from training.	91.2%	3.5
Your co-workers have been interested in new ideas you gained from training.	95.5%	3.6

Assertion	Respondents Agreeing with Assertion	Mean Intensity of Agreement with Asser (2- marginally true 3- true; 4- very true; 5- extremely true)
Your training has contributed to professional advancement such as a promotion, greater responsibilities, increased pay or a change to a better job.	61%	3.2
You have maintained social or professional contacts made while you were in training	86%	3.2
You have not been able to use your training fully because of bureaucratic impediments.	52.5%	3.4
You have not been able to use your training fully because of lack of technology.	52%	2.9
You have not been able to use your trainingfully fully because you have encountered resistance to new ideas or change.	33.8%	2.7
You have not been able to use your training fully because of lack of working capital.	52.7%	3.3
Your training was satisfactory, however, you have been transferred or professionally placed so that your training has become less relevant.	35%	3.3

In-Country

In addition to the overseas training which is the focus of this report, USAID agriculture and rural development projects sponsored in-country technical training for thousands of local professionals through over 100 workshops, seminars, study tours, and OJT programs.

In the field, many thousands of farmers received technical training through project-supported extension activities.

Local education institutions, under contract, provided training in English, mathematics, and sciences to 169 overseas training candidates from Sindh, Balochistan, and the Northern Areas, in the interest of encouraging greater representation from these educationally disadvantaged regions among candidates for overseas training.

Between 1989-1992, 91 students, including 26 women, were assisted by USAID funding to complete post-secondary degrees in forestry at the Pakistan Forest Institute.

In 1990-1991, with USAID support, Kansas State University faculty teamed with faculty of Quaid-i-Azam University to conduct a non-degree, post-graduate program in agricultural economics, attended by 24 students. The program was intended to attract talented agriculture-graduates into work, or further study, in agricultural economics.

As always in situations of bi-lateral project implementation, significant knowledge and skills transfer occurred, on an informal basis, between members of technical assistance teams and local professional colleagues.

In-country training accomplishments of six recent or on-going projects and the Agriculture Sector Support Program are summarized in data set 1.5 following.

1.5 In-Country Training Notes

Agriculture

Transformation and Integration of Provincial Agricultural Network (TIPAN)

TIPAN in-country training activities included workshops on technical writing, preparation of research proposa's, management skills, outreach program development, women's programs, agribusiness, computer applications, desk-top publishing, teaching methods, and computerized financial management. On-job training was provided in database management to library and personnel staff members. In addition, the Directorate of Continuing Education, initiated under TIPAN, conducted 31 training courses in which 694 persons from in-service and external groups participated.

Management of Agricultural Research and Technology (MART)

MART's in-country training program helped over 4200 scientists and farmers from across the country to learn new skills and to keep abreast of new developments. Over 130 workshops, seminars and short courses were offered during the period 1986-1993 at the NARC Training Institute and provincial locations in a wide range of subjects, such as crop improvement, pest management, livestock production, biotechnology, range management, farm machinery, laboratory equipment repairs, computer science, and library management. Physical infrastructure and computer training laboratories at NARC Training Institute have been expanded to meet the challenge of technology transfer from the research laboratory to the farm.

Agriculture Sector Support Program (ASSP)

In-country preparatory courses were conducted as a precursor to overseas training for 169 nominee participants. Between 1988-1992, four 9-month sessions were conducted at the **Center for Advanced Molecular Biology,** Lahore for 89 public sector trainees from Balochistan and Northern Areas. During the period 1990-1992, 80 overseas training candidates from Sindh, received training at the **Institute of Business Administration,** Karachi. The purpose of the training was to upgrade English language and analytic skills to qualifying levels fc training in the United States.

In addition about 300 person-months of on-job training were imparted to the staff of the Economic Policy Wing, MINFAC in micro-computer applications, input-output modeling, technical writing and applied economics.

Food Security Management Project (FSM)

13 workshops were held in fields of marketing, policy analysis, technical writing, research methodology, applied economics, econometrics, and computer applications. Approximately 500 professionals from all provinces, representing public and private sectors, participated in the workshops. Under the Storage Technology and Development Transfer component of the project, 1900 persons received training in storage management, pest control, cost effectiveness, quality control and computer applications. Participants were selected from provincial Food Departments, Pakistan Agricultural Supply and Storage Corporation, and the private sector.

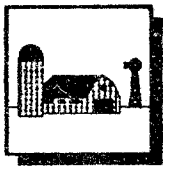
Projects and Programs of the Office of Agriculture & Rural Development 1984-1993

Forestry

Forestry Planning and Development Project (FP&D)

During the four-year period 1989 - 1992, the project aided 91 students, including 26 women, to earn post-secondary degrees in Forestry; 48 earned B.Sc. degrees and 43, M.Sc. degrees, at the Pakistan Forest Institute.

In addition, short-term in-service training was provided to 778 Forest Department staff members, 402 village motivators, and thousands of farmers. 1,717 persons participated in NGO training activities. The areas in which training was provided included tree planting, soil conservation, land development methodologies, nursery technology, farm woodlot management and product marketing.



Rural Development

Tribal Areas Development Project (TAD)

TAD involved over 600 farmers, operating or starting private orchards and fruit nurseries, in on-site demonstrations of pruning, water management, and pesticide and fertilizer application, in conjunction with cultivation of apples, apricots, plums, loquats, persimmons and other marketable fruits.

Over 100 farmers and field staff of the Agricultu.. Department of the Federal Administration for Tribal Areas (FATA) participated in observation visits to fruit farms in Balochistan and refresher training at Agricultural Research Centers in Islamabad and Kalam.

Balochistan Area Development Project (BALAD)

In conjunction with implementation of 153 on-site farm demonstrations of improved varieties of grains and fruits (particularly wheat and grapes), BALAD trained several hundred farmers in improving cultivation and water management techniques.

Four senior officials of the Balochistan Planning & Development Department participated in a study tour to Gilgit to observe and exchange views on a) the role of NGOs in development and b) data collection and planning techniques of the Aga Khan Rural Support Program.

Approximately 125 people received training, in six workshops, in management, operation, and maintenance of BALAD's equipment fleet, including front-end loaders, dump trucks, rollers and dozers.

2 Benefits and Beneficiaries

Feedback from Management and Returned Participants

Institutional Profiles

Benefits

Returned participants bring to their jobs and workplaces new methodologies and techniques, new attitudes, and improved language skills. Managers and former participants typically characterize the impact of training on organizational and personal performance in terms of enhanced professionalism, dedication, and vision. Respondents speak variously and generally of *greater awareness and knowledge, enhanced capabilities, sense of professional community*, and *confidence to work independently*. Participants returning to staff up young institutions are more likely to have major institutional impact, typically joining colleagues with similar overseas experiences and enthusiasm to achieve results.

Returned participants frequently refer to an important sense of themselves as members of an international network of professionals, as a result of the overseas training experience. Contacts made during training often present opportunities to contribute to, and benefit from, the work of others addressing common challenges in similar agro-ecologic zones. Researchers frequently work with germ plasm and plant species provided by colleagues met in the course of training programs. In response to the question of what most would assist them in accomplishing their professional ambitions, senior respondents commonly mention more frequent contacts with fellow professionals.

Many returned participants evidence an acquired accustomedness to democratic processes, particularly decision-making through consultation and consensus building among colleagues, strengthened by, if not attributable to, the overseas experience. Similarly, returned participants frequently evidence an enhanced appreciation for the private sector as principle engine of development, tending to analyze interventions in terms of their prospective attractiveness to investors---a tendency less in evidence among those with little or no overseas experience. Returned participants have been instrumental in inducing state-run universities, strapped for funds, to emulate overseas counterparts, finding mutual benefit in alliance with private industry. Sindh Agricultural University, for

example, conducts joint research with a major agribusiness international which provides equipment and other resources to the university.

In many organizations, returned participants are in the forefront of revolutionary changes through computerization. Participants trained in specialized packages for collection and collation of scientific and social data are rapidly sharpening awareness of ecological dynamics and the effects of human interventions. Others trained in administrative and financial applications are contributing to the greater efficiency and economy of their organizations.

The encounter with modern pedagogic methods typically impresses participants. Respondents variously express appreciation for the *participatory* and *student-centered* nature of American training; a university instructor speaks of a new-found awareness of *training as a continuous activity proceeding on formal and informal levels*, inspiring him to reflect on and make changes in his pedagogic methods. Many returned educators express a desire for further training in instructional methods. Beyond the classroom, improved communication techniques are the focus of returned extensionists involving farmers directly in innovation and the measurement of its results through on-farm trials; benefits are evident in the increasing number of farmers seeking, and willing to pay for, services and inputs previously funded in part or in whole by the government and donor agencies. Prominent examples are the areas of drainage technology and the practice of commercial and social forestry.

A successful training opportunity may prove the springboard for further opportunities, as in the case of the returned participant who continued research begun under USAID support through a Fulbright grant.

It is apparent that the opportunity to train outside of Pakistan is esteemed as intellectually stimulating and professionally rewarding. Certainly the overwhelming response to the encounter with America and Americans is positive. Typical words used by respondents to define American values they came to appreciate are: *frankness, honesty, helpfulness, dedication to the job, discipline, punctuality,* and *the desire to learn.*

Beneficiaries

Over the last decade, dozens of public sector organizations and hundreds of private enterprises have been the beneficiaries of USAID-supported training through employee beneficiaries. Statistics on participants of major public and private institutional beneficiaries (four or more employee participants) are shown hereafter in data set 2.1.

In the last ten years, USAID continued its longstanding support to higher education in agriculture, giving an opportunity to 145 faculty and staff of 11 colleges and universities to improve their skills through a graduate-degree program in the US; 195 faculty and staff were beneficiaries of short-term training opportunities.

Over half of academic participants returned to work at the new NWFP Agricultural University in Peshawar. Here, as at the University of Agriculture, Faisalabad, a major beneficiary of earlier USAID-supported HRD, the majority of faculty share the common experience of graduate training in the United States. Pakistan's three agricultural universities and the Pakistan Institute of Forestry are profiled in data set 2.2.

In the area of scientific research, USAID provided graduate-degree training opportunities for upwards of 100 research professionals in 16 research centers; 164 researchers were beneficiaries of short-term training opportunities. The Pakistan Agricultural Research Council, the overseer of federal-supported research, added three Master's and eight new PhD recipients to its staff as a result of USAID support. Major cooperation took place with PARC in the establishment of the National Agricultural Research Center (NARC), founded 1982. The NARC staff currently includes eleven PhDs who earned their doctorates in the US with USAID support. Three other specialist research institutions founded within the last 20 years also received significant HRD support: the Drainage and Reclamation Institute of Pakistan; the Arid Zone Research Institute; and the National Institute for Biotechnology and Genetic Engineering. These institutes and NARC, as well as the long-standing and internationally-reputed Ayub Agricultural Research Institute are profiled in data set 2.3. The Agricultural Research Institute, Tarnab, NWFP, was the single greatest recipient of assistance among research institutions (47 beneficiaries) owing to its participation in TIPAN.

In the area of resource management, USAID supported training for 130 Fellows and over 650 Associates concentrated in 32 organizations. The Food & Agriculture Division of the Ministry of Food, Agriculture, & Cooperatives (MINFAC) and the Irrigation & Power Department, Punjab, were major beneficiaries, each with over 100 participants.

2.1 Institutional Concentrations of Returned Participants

Field/Institution	Site(s)	Acad	Tech	MS	PhD	Male	Female	Total
Education & Training								
Balochistan Agriculture College	Quetta	5	1	5	0	6	0	6
Barani Agriculture College	Rawalpindi	6	3	0	6	9	0	9
College of Veterinary Science	Lahore	7	1	1	6	8	0	8
Gomal University	D.I. Khan	2	4	1	1	6	0	6
Mehran Univ. of Engineering & Technology	Jamshoro	1	5	1	0	6	0	6
NWFP Agriculture University	Peshawar	79	54	27	52	131	2	133
Pakistan Forest Institute	Peshawar	7	23	7	0	30	0	30
Sindh Agriculture University	Sindh	7	23	2	5	30	0	30
University of Engineering & Technology	Lahore	4	8	2	2	12	0	12
University of Engineering & Technology	Peshawar	0	4	0	0	4	0	4
University of Agriculture	Faisalabad	27	69	24	3	95	1	96
Subtotal		145	195	70	75	337	3	340

2.1. Institutional Concentrations of Returned Participants, cont.

Field/Institution	Site(s)	Acad	Tech	MS	PhD	Male	Female	Total
Scientific Research								
Ayub Agriculture Research Institute	Faisalabad	5	21	1	4	26	0	26
Agriculture Research Institute	Tarnab	30	17	17	13	47	0	47
Agriculture Research Institute	Tando & Hyd	2	5	0	2	7	0	7
Agriculture Research Institute	Sariab	6	7	5	1	13	0	13
Arid Zone Research Institute	Quetta	8	8	1	7	16	0	16
Barani Ag. Research Institute	Chakwal	2	4	1	1	6	0	6
Cereal Crops Research Institute	Nowshera	8	6	6	2	14	0	14
Drainage & Reclamation Inst. of Pakistan	Tandojam	3	8	3	0	11	0	11
National Agriculture Research Centre	Islamabad	12	24	1	11	35	1	36
National Institute of Agriculture & Biology	Faisalabad	1	5	0	1	3	3	6
National Inst. of Biotech. & Genetic Engg.	Faisalabad	3	6	1	2	9	0	9
Pakistan Agriculture Research Council	Islamabad	11	26	3	8	35	2	37
Pak. Council for Res in Water Resources	Islamabad	5	17	4	1	21	1	22
Sugar Crops Research Institute	Mardan	1	4	1	0	5	0	5
Veterinary Research Institute	Punjab	0	6	0	0	6	0	6
Veterinary Research Institute	Baiochistan	6	0	5	1	6	0	6
Subtotal		103	164	49	54	260	7	267
Resource Management								
Agriculture Department	Balochistan	2	9	2	0	11	0	11
Agriculture Department	AJK	7	0	4	3	7	0	7
Agriculture Department	Sindh	6	6	6	0	12	0	12
Agriculture Department	NWFP	1	8	1	0	9	0	9
Agriculture Department	Punjab	5	24	4	1	29	0	29
Communication & Works Department	Quetta	1	5	0	1AS	6	0	6
Federally Administered Tribal Area	Peshawar	1	13	0	1	14	0	14
Federal Bureau of Statistics	Islamabad	5	40	5	0	44	1	45
Food & Agriculture Division	Islamabad	10	99	10	0	107	2	109
Food Department	NWFP	0	4	0	0	4	0	4
Food Department	Sindh	0	10	0	0	10	0	10
Food Department	Punjab	0	8	0	0	8	0	8
Forest Department	NWFP	3	12	1	2	15	0	15
Forest Department	Punjab	3	20	2	1	23	0	23
Forest Department	Federal	0	5	0	0	5	0	5
Forest Department	Balochistan	4	9	3	1	13	0	13
Forest Department	Sindh	7	14	6	1	21	0	21
Gadoon Amazai Project	Swabi	0	6	0	0	6	0	6
Irrigation & Power Department	Sindh	1	39	1	0	40	0	40
Irrigation & Power Department	NWFP	0	42	0	0	42	0	42
Irrigation & Power Department	Balochistan	3	27	3	0	30	0	30
Irrigation & Power Department	Punjab	17	100	12	5	117	0	117
Livestock Department	Punjab	5	8	1	4	13	0	13
Livestock Department	Sindh	6	3	4	2	7	2	9
Ministry of Water & Power	Islamabad	1	23	1	0	24	0	24
National Engineering Services Pak Ltd.	Lahore	8	0	7	1	8	0	8
On Farm Water Management	Sindh	0	5	0	0	5	0	5
On Farm Water Management	Balochistan	0	6	0	0	6	0	6
On Farm Water Management	NWFP	2	10	2	0	12	0	12
On Farm Water Management	Punjab	4	13	4	0	17	0	17
Pak Agriculture Storage & Supply Corp.	Lahore	0	16	0	0	16	0	16
Water & Power Development Authority	Various	28	71	25	3	99	0	99
Subtotal		130	655	104	26	780	5	785
Private Sector								
Milkpak Limited	Lahore	2	3	2	0	3	2	5
Olympic Poultry	Punjab	0	4	0	0	4	0	4
Water Users Association	Sindh	0	5	0	0	5	0	5
Water Users Association	Punjab	0	5	0	0	5	0	5
Water Users Association	NWFP	0	5	0	0	5	0	5
Subtotal		2	22	2	0	22	2	24
Grand Total		380	1,036	225	155	1,399	17	1,416

2.2 Major Public Sector Institutional Beneficiaries in Education and Training

University of Agriculture Faisalabad

1984 - 1993 Participants	Total	Technical	Academic	Masters	Doctorates	Males	Females
	96	64	27	24	3	95	1

Oldest agricultural educational institution in Pakistan, established 1909, as an agricultural college, affiliated to Punjab University.

Raised to the status of a university in 1961 with USAID-funded technical assistance through Washington State University, Pullman. Most faculty members and administrative staff have been trained under successive USAID programs during the last 30 years. University has faculties of agriculture, veterinary science, animal husbandry, agricultural economics & rural sociology, basic sciences, and agricultural engineering. The College of Veterinary Sciences, located at Lahore, is a constituent college of the University.

Pursuant to recommendations of a "blue-ribbon" committee, USAID recently provided UAF with 120 microcomputers for research and teaching purposes. This has enabled the University to offer a Master's degree in computer science and to strengthen the information base for research and teaching.

Pakistan Journal of Agricultural Sciences published quarterly.

Sindh Agriculture University (SAU) Tandojam

1984 - 1993 Participants	Total	Technical	Academic	Masters	Doctorates	Males	Females
	30	23	7	2	5	30	0

University traces its origins to 1926 when the Government of Sindh established an Agricultural Research Station at Sakrand in Nawabshah District. In 1939 the Research Station was transformed into an Agriculture College by assigning teaching functions to the research staff.

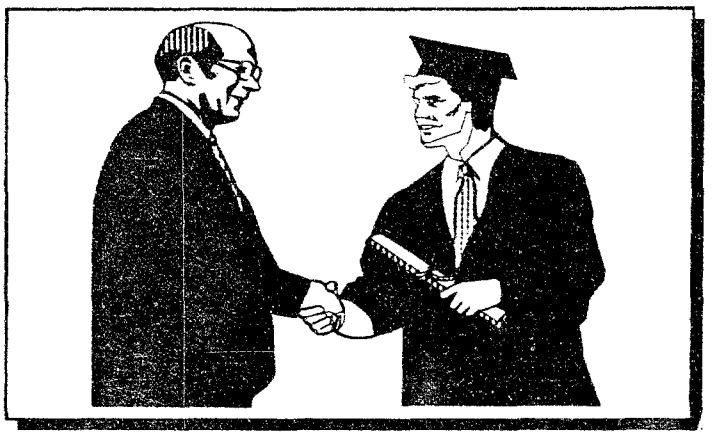
After the creation of Pakistan, the Agriculture College along with the Research Station was shifted to Tandojam near Hyderabad in 1955. The College was upgraded to the level of a university in 1977.

Prior to the establishment of an Agriculture College in Quetta, Sindh Agriculture University served both the provinces of Sindh and Balochistan, comprising over 60% of Pakistan's total area.

The University offers undergraduate and graduate programs in the faculties of crop production, crop protection, agricultural social sciences, agricultural engineering and animal husbandry & veterinary sciences.

SAU has been expanded and equipped itself with assistance from the University Grants Commission, USAID, the World Bank and other donor agencies.

Library and information services have been strengthened through technical assistance provided under MART. The ACE program provided funds for purchase of 80 computers which are being used for research and teaching.



NWFP Agricultural University Peshawar

1984 - 1993 Participants	Total	Technical	Academic	Masters	Doctorates	Males	Females
	133	54	79	27	52	130	3

Originally set up as Faculty of Agriculture under the University of Peshawar. Raised to the status of a university in 1981, it has rapidly grown into a modern teaching, research and extension institution with technical assistance from TIPAN through the Universities of Illinois and Southern Illinois. Construction of library, plant science building, computer laboratory, experimental farm and student/faculty center, at a cost of $20m are nearly completed. In addition $2m have been provided for scientific equipment and books. Provincial research stations have been strengthened and computerized.

NWFP Agricultural University is unique in Pakistan for its successful linkage of research with the provincial agricultural extension system. Curriculur is being updated and upgraded to improve teaching, research and outreach activities. Efforts have been made to extend educational opportunities for women.

TIPAN and MART projects collaborated in setting up a National Agricultural Textbook Task Force for production of up-to-date textbooks for agriculture universities. One textbook has been published and five others are being edited for publication. University library and the libraries of provincial research institutes have been equipped with high-tech databases and auxiliary equipment to meet the needs of researchers, teachers, students, extentionists and private sector users.

Pakistan Forest Institute (PFI) Peshawar

1984 - 1993 Participants	Total	Technical	Academic	Masters	Doctorates	Males	Females
	30	23	7	7	0	30	0

National institute of education and research in forestry and forest products, founded 1947, training human resources for forestry science and commerce and exploring improved ways and means of forestry management. Affiliated with the University of Peshawar to award B.Sc. and M.Sc. in Forestry. Over 1000 research publications; majority of 80+ faculty involved in research, continuing education and extension programs. Twenty-one technical units include silkworm breeding, medicinal plants, and composite woods. Current initiatives include improvement of research and training facilities in range management.

Past donors include FAO, FORSPA, ACIAR and USAID F/FRED.

2.3 Major Public Sector Institutional Beneficiaries in Scientific Research

National Agricultural Research Center (NARC) Islamabad.

1984 - 1993 Participants	Total	Technical	Academic	Masters	Doctorates	Males	Females
	36	24	12	1	11	35	1

Federal centre of excellence for research and training in crop and animal sciences, natural resources, and social sciences, established 1982; principal research institute under PARC. USAID provided construction and equipment funding under **Strengthening of Agricultural Research Capabilities in Pakistan**. Main facilities, completed 1984, include administrative offices, laboratory blocks, library, auditorium, training center and hostels. Since 1984, USAID's **Management of Agricultural Research and Technology (MART)** has supported construction of an audio-visual center and expansion of NARC's Training Center to include four lecture halls, four seminar rooms, two dry-wet laboratories, and two computer training laboratories. Other supporting donor agencies include the World Bank, FAO/UNDP, CIDA, CIMMYT, the Australian Development Assistance Bureau, and the Italian Technical Assistance Program.

Drainage and Reclamation Institute of Pakistan (DRIP) Tando Jam, Sindh.

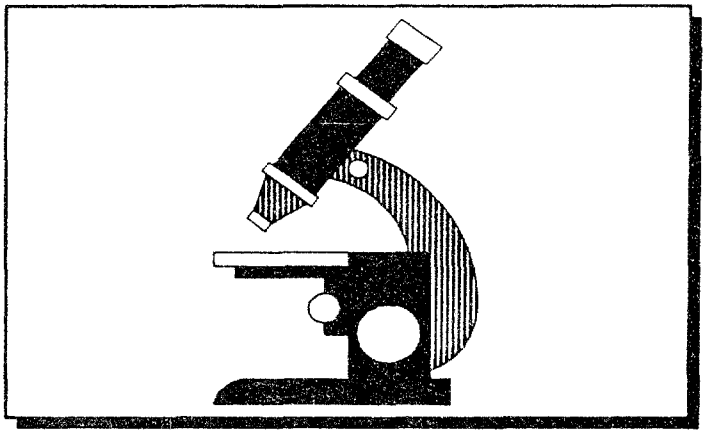
1984 - 1993 Participants	Total	Technical	Academic	Masters	Doctorates	Males	Females
	11	8	3	3	0	11	0

Federal organization, founded 1975, under the umbrella of MOST/PCRWR dedicated to scientific, technological, and economic research of problems in irrigated agriculture, with particular focus on waterlogging and salinity; direct involvement in implementation of on-farm trials. Areas of research include water and soil management, groundwater modelling, and drainage and reclamation technologies.

USAID support, including equipment and materials, to introduction of on-farm, tile drainage systems, co-financed by farmers. Additional assistance in research instrumentation and computerization for purposes of modelling, statistical record keeping and analysis, publications, and administration. Local institutional collaborators include PSF, IWASRI, AEARC (Tando Jam), SFD, SAU, and MUET. International collaboration with University of New Castle upon Tyne and University of London; also with government of Egypt under IPTRID.

Chairman, PCRWR, is Chairman of Board of Governors. Technical Advisory Committee evaluates research proposals. Members of Board and Committee drawn from MOST, PARC, PSF, WAPDA, IWASRI, Irrigation Department, and agricultural universities.

Journal of Drainage and Reclamation published semi-annually.



Arid Zone Research Institute (AZRI) Quetta, Balochistan, and provincial substations in Umerkot (Sindh), Bahawalpur (Punjab), and Dera Ismael Khan (NWFP).

1984 - 1993 Participants	Total	Technical	Academic	Masters	Doctorates	Males	Females
	16	8	8	1	7	16	0

Federal organization, part of PARC's national network, charged with research of agricultural and environmental issues in non-irrigated, arid and semi-arid zones of Pakistan (annual rainfall under 350mm), accounting for half of Pakistan's land mass. Also involved in extension and on-farm trials.

Areas of research include profiling of ecological zones, prevention and reversal of environmental degradation, and improvement of small ruminant production and dryland cropping consistent with preservation of biological diversity and environmental health. Particular research focuses on improvement of rangeland and forage resources, livestock nutrition and health, water harvesting and management, and crop yields.

National Institute for Biotechnology and Genetic Engineering (NIBGE), Faisalabad

1984 - 1993 Participants	Total	Technical	Academic	Masters	Doctorates	Males	Females
	9	6	3	1	2	9	0

Federal organization, established 1987, as a high-tech institute for research and training in biotechnology. Two laboratory blocks, administration/training block, workshop, fermentation block, and hostels for males and females completed to date. Research work divided into six areas: plant biotechnology, biofertilizers, biofuels, biotechnology of minerals and fossil fuels, environmental biotechnology, and basic biology (including biomedicine). Manpower trained earlier for NIAB formed the nucleus for NIBGE. Other donor agencies include UNESCO, British Council, German Biotechnology Institute, and International Center for Genetic Engineering and Biotechnology.

Ayub Agricultural Research Institute (AARI), Faisalabad

1984 - 1993 Participants	Total	Technical	Academic	Masters	Doctorates	Males	Females
	24	20	4	1	3	24	0

AARI dates to 1909 when the Punjab Agricultural College and Research Institute were established at Lyallpur (later renamed Faisalabad). Following conversion of the college to a university in 1961, it became independent, serving as the principal research facility for Punjab province with a number of sub-stations spread in different agricultural zones of the province. AARI is organized into monocrop/monodiscipline institutes, including Wheat Research, Oilseeds Research, Vegetables Research, Plant Protection, and Soil Salinity Research. The Institute has been successful in developing high yielding, pest resistant varieties of crops for different agro-ecological regions of Pakistan. Wheat, rice, cotton, sugarcane, oilseed, oat, and lentil cultivars and varieties have made a sizable impact on the production of these crops in the province. Scientists of the Institute responsible for development of new varieties have received national and international recognition.

3 Lessons Learned

Increasing the Effectiveness and Efficiency of Human Resources Development

Many colleagues involved in USAID's agricultural-sector HRD initiatives over the decade have shared with us their reflections on the undertaking. Two concerns predominate their thinking: effectiveness of resource deployment and administrative simplicity; how best to program funds, how to promote the integrity and efficiency of implementation, and how to assess impact. A sample of issues are summarized, with comment, below.

Sectorally- *versus* Institutionally-Focused Training

In a professional domain as large as Pakistan's agricultural sector, HRD planners, faced with scant resources, are challenged to find a balance between promoting improved skills widely, but thinly, through the sector and lending intensive support to staff development in critical, often nascent, organizations. The ARD training portfolio of the last decade employs a mix, ranging from open-ended, "non-projectized", HRD supported by the Agricultural Sector Support Program, to the highly institutionally-focused HRD supported by TIPAN.

The success of the sectorally-focused approach is conditioned upon the ability to identify trainees of merit in priority fields whose organizations can be counted upon to support them upon return. In well-managed organizations, training provided to one or a few talented and motivated individuals at important output points can have far-reaching organizational and developmental effects; examples are the manager who revolutionizes an administrative system saving his organization a significant percentage of budget or the scientist who develops an important cultivar increasing national income---each inspired by his or her training experience. On the other hand, inefficient organizations unreceptive to isolated innovators and new organizations not yet fully staffed, may, by virtue of their command of critical resources and domain, call for large-scale inputs.

USAID's HRD experience in agriculture and rural development in Pakistan during the last ten years is marked by large-scale random input. Some 600 participants were alone, or among less than four, from their organization. This reflects a combination of the generosity of financing available, the practical impossibility of "projectizing" all of it, and a vote of confidence in Pakistani professionalism.

An assessment of the effectiveness of these two approaches in agricultural HRD in Pakistan in the last decade is beyond the scope of the present report.

Priority-based Field-of-Training Selection, Merit-Based Nominations, and Job Continuity

Maximizing the likelihood that training will be targeted on priority skill areas, that nominees will be selected from among those best qualified, and that returned trainees will continue to work in the area for which they were trained, are additional concerns of HRD planners and administrators.

Likelihood of fulfillment of these expectations is enhanced when participating organizations agree to 1) indicate end uses of training and their relation to organizational objectives and priorities, 2) select nominees through competitive processes, and 3) maintain returned participants in positions which give scope for use of their training.

In more extensive cooperative undertakings with organizations inexperienced in projecting HRD requirements, the donor may build into the scope of cooperation the conducting of an organizational training needs assessment.

While a measure of politics may be inevitable in the allocation of training opportunities, nomination of candidates, and placement of returnees, such techniques enhance the likelihood that needed training will go to those able and supported to take best advantage of it.

Special Assistance to Educationally Disadvantaged Regions and Cadres

To meet the objective of upgrading professional skills throughout the country and in all dimensions of the development effort, special assistance will continue to be required to provide a fair representation of educationally disadvantaged regions and cadres. The use of in-country educational facilities to upgrade the language and technical capabilities of otherwise unqualified participant-training nominees has demonstrated the effectiveness of these institutions in addressing skill-upgrading requirements and may be recommended so long as need for such training continues.

Generic Skills and Pre-Return Orientation

Both HRD administrators and returned participants, particularly long-termers, acknowledge the desirability of supplementing specialist training with generic training in management and communications, as well as orientation prior to return to the local workplace.

Increasingly, returned participants are expected not only to possess enhanced skills in their specialization, but to be institutional agents-of-change, promoting, by initiative or example, improved methodologies in teaching, research, organization, public relations, and fund-raising. Both participants and organizations benefit from the integration into specialized programs of generic elements such as pedagogy, management, report and proposal writing, and computer applications.

In addition, participants returning home after 1-5 years abroad may benefit from pre-return orientation, encouraging them to project themselves back into their former working environments and to anticipate and formulate appropriate responses to predictable obstacles and frustrations to which they have grown unaccustomed while abroad. Realistic expectations, a sense of behavioral psychology, and knowledge of methods to bring about change in change-resistant environments, may spare returning participants counterproductive responses as they return to old strictures, while enhancing their self-image, capacity, and sense of community with other returning participants, as

agents-of-change.

Under the TIPAN project, computer and communication skills training were built into participant programs during inter-session intervals. Winrock International, which monitored agricultural participants for two years between 1988-91 as a subcontractor to AED, developed and conducted pre-return training for long-term participants. The benefits of such supplementary training may greatly outweigh the associated increase in program cost.

In future HRD initiatives, local post-secondary institutions may be supported to develop curricular offerings in management, pedagogy, and communications skills as appropriate adjuncts to the preparation of professionals with diverse competencies.

Enhancing Post-Return Investment of Skills and Networking

Over and above measures discussed earlier to enhance the likelihood of job continuity, additional steps may be taken to enhance return on invested skills.

The TIPAN project, closely associated with the development of the NWFP Agricultural University and related provincial research and extension institutions, established a re-entry committee composed of senior administrators, faculty, and researchers, including returned participants, to promote maximal post-return investment of skills. The committee's function is to confer with returnees to identify opportunities for them to apply and disseminate their newly acquired skills through curriculum and program innovation and initiation of, or involvement in, relevant research work. The project enhances the likelihood of such investment by making funds available to support important, innovative work by returned participants.

Networking among local professionals is important to build upon existing knowledge, to identify areas of potential cooperation, and to avoid duplication of effort. In this respect, TIPAN again was innovative in drawing together academicians, researchers, and extensionists through seminars and guest-speaker programs. Funding was also made available for professionals achieving significant research results to present their findings at national and international conferences. TIPAN also supports compilation and distribution of information on research-in-progress within the province and beyond.

As opportunity has arisen, DSTP, through its Follow-Up Unit, has similarly supported get-togethers of returned participants and their colleagues, typically centered around a talk by an American professional visiting Pakistan.

USAID presently supports, to a limit of $225, subscriptions for in-training and returned Fellows to U.S. professional periodicals Future HRD interventions may consider support to local professional periodicals and data networks, as yet inchoate, and to linking Pakistani institutions to international data networks.

Future HRD interventions may also profitably support the institutionalization of dialogue among local training and education institutions, related public regulatory authorities, chambers of commerce, and labor organizations to keep education and training institutions abreast of and responsive to changing skill requirements of the economy.

Estimating Duration of Graduate-Degree Programs

Project Officers, monitoring their funds and the progress of costly graduate students, wonder whether there might be a way to avoid spending so much time assessing requests from Fellows for extensions (usually of four to six months) to complete degree requirements. Extensions approved, which most are, take additional time in production, review, approval and filing of amended program documents.

At present, master's programs are initially funded for two years (excepting one-year programs) and doctorate's for three. While extension requests from master's candidates are not uncommon, requests come more frequently from doctoral candidates. With respect to doctoral extensions, AED administrators are in agreement that a three-year horizon is, in all but a few cases, unrealistic by at least a year. While keeping Fellows on a short time-leash may have its advantages in pressing them to peak performance, an argument may also be made for giving latitude to Project Officers to determine realistic timeframes on a case-by-case basis, while conditioning continued funding on success in annual performance reviews. Extensions, it may be noted, relate not only to weaker candidates whose performance has been slower than anticipated, but as well to more gifted candidates undertaking research of more than average scale or complexity.

That said, the time costed to project officers in maintaining awareness of the program and progress of Fellows under their charge should be anticipated and its importance appreciated. In Pakistan, many USAID project officers are Pakistanis and themselves important members of the professional networks to which participants return.

Assessing Impact

Traditional assessments of impact of HRD initiatives, to which the present report is no exception, rely heavily upon printed survey instruments and interviews of beneficiaries, their superiors and colleagues.

Printed surveys, all too often, tend to be ambiguous and largely ignored (our survey-by-mail, was returned by less than half of those solicited). In addition, survey conclusions tend to be colored by cultural predispositior -eg, respondents from one culture will typically mute or ignore criticism in responding, while those of another will feel compelled to balance applause with criticism to maintain a culturally-defined appearance of objectivity.

While the suggestive value of opinion gleaned from surveys and personal encounters is to be appreciated, there exist techniques of evaluation of greater sensitivity and rigor that may be brought into play economically to achieve a more detailed and persuasive assessment of the return on HRD investments. In the context of extensive or model HRD investments, donors and collaborating governments may reap significant insight and enhanced support for future HRD by funding in-depth, long-term research, by professionals or doctoral candidates in manpower development. Application of cost-benefit analysis and case study methodology to HRD-- over a longer-term and with greater expertise than is typically available on most project teams-- will likely lead us to greater confidence in the prevailing intuition that well-conceived investment in human resources is the single most powerful lever of economic and social development.

Annex
Doctoral Degree Information

Name of Degree Recipient or Candidate
Dissertation Title
University Awarding Degree
Year of Degree Award
Initials of Employer of Record (see codes overside)

Entries are grouped by field, as follows:

	Employer of Record	Entry No.
AAR	Ayub Agriculture Research Institute, Faisalabad	33,74
AID	USAID - ARD	145
ANC	Animal Nutrition Centre, Dera Rakh Chal	79
ARD	Agriculture Research Institute, D.I.Khan	2,15,19,20,55
ARI	Agriculture Research Institute, Sariab	72
ARP	Agriculture Research Institute, Tarnab, Peshawar	23,65,77
ART	Agriculture Research Institute, Tandojam	13,59
AZR	Arid Zone Agriculture Research Institute, Quetta	10,11,24,35,88,117
BAC	Barani Agriculture College, Rawalpindi	36,44,70,102,157
BAR	Barani Agriculture Research Institute, Chakwal	1
CCR	Cereal Crops Research Institute, Pirsabak	16,17
CPC	Cargill Pak Citrus Ltd., Lahore	167
CVS	College of Veterinary Science, Lahore	80,86,87,96,103
DAA	Department of Agriculture, AJK	58,71,161
DAS	Department of Agriculture, Sindh	143
ERI	Punjab Economic Research Institute, Lahore	131
FDA	Forest Department, AJK	124
FDB	Forest Department, Balochistan	115
FDC	Forest Development, FATA	121
FDN	Forest Department, NWFP	122,125
FDP	Forestry & Fisheries Department, Punjab	94,95,116,120
FDS	Forestry Division, Sindh	41,118
FSC	Federal Seed Certification Department	52,67
GU	Gomal University, D.I. Khan	30,37
HRI	Sindh Horticulture Research Instt. Mirpur Khas	25
IBG	National Institute for Biotechnology & Genetic Engineering, Faisalabad	172
IMI	International Irrigation Management Instt. Lahore	129
LDD	Livestock and Dairy Development Department, Lahore	83,106,168
LES	Livestock Experiment Station, Bhuneky	110
LPR	Livestock Production Research Instt. Bahadurnagar	89,97
LSM	Layyah Sugar Mills, Layyah	165
NAR	National Agriculture Research Center, Islamabad	3,4,6,22,29,32,39,40,45,51,66,81,85,90,92,123,136,149,159,162
NAU	NWFP Agriculture University, Peshawar	9,12,18,21,26,27,28,31,42,50,53,54,56,57,63,76,93,101,107,109,111,147,151,152,156
NSK	National Engineering Services Pakistan, Lahore	132,141
NSR	National Seed Registration Department	73
ORI	Oil Seed Research Institute, Faisalabad	5,34
PAC	Pakistan Atomic Energy Centre, Faisalabad	7
PAR	Pakistan Agriculture Research Council, Islamabad	64,114,150,153,155,158
PCR	Pakistan Council for Research in Water Resources, Islamabad	126
PFI	Pakistan Forest Institute, Peshawar	128
PID	Pakistan Institute of Development Economics	148
PSC	Punjab Seed Corporation, Lahore	146
SAU	Sindh Agriculture University, Tandojam	61,78,130,134,144,154,166
SWT	Soil and Water Testing Lab., Bahawalnagar	48
UAF	University of Agriculture, Faisalabad	8,14,38,43,46,47,49,60,62,69,75,82,84,91,98,100,104,112,113,119,137,138, 140,160,163,164,170,171
UET	University of Engineering and Technology, Lahore	127,135,142
VRI	Veterinary Research Institute, Peshawar	105,108
WAP	Water and Power Development Authority	133,139
WRI	Wheat Research Institute, Faisalabad	68,99

Doctoral Recipient	Doctoral Thesis Title	University Awarding Degree	Year	A
	CROP SCIENCES			
Abdul Hameed	Potential of the Maize Race "Cateto" to Improve U.S. Corn Belt Hybrids	Iowa State University	91	BAR
Abdul Latif	Semi-Chemical Control of the Behavioral Responses of Adultadacine Fruit Flies	University of Kentucky	92	ARD
Abdul Majeed Haqqani	Water Use, Growth and Yield of Water Stressed and Irrigated Mungbean (Vigna radiata L.Wilczek) at Different Growth Stages and Two Planting Densities	George Washington University	91	NAR
Abdul Majid	Biological Studies on the Walnut Husk Fly	Oregon State University	94	NAR
Abdul Rashid	The RSS System of Unidirectional Cross-Incompatibility in Maize; Control by the Interaction of Non Allelic Male and Female Genes.	Iowa State University	91	ORI
Abdur Rehman Khan	Soybean Simulation for Yield in Kansas	Kansas State University	93	NAR
Aftab Bashir	The Role of Repetitive DNA Sequences in Maize Genome Adaptation and Integrative Gene Expression	University of Illinois	94	PAC
Aftab Hussain	Chemical Ecology of Tribolium: Response of Adults to Phermone, Food and Traps	Oregon State University	94	UAF
Amanullah Bhatti	Application of Geostatistics Methods to Statistical Analysis of Field Experiments	Washington State University	87	NAU
Arshad Ali	Growth and Yield of Wheat as Affected by Salinity and Mixed Ammonium and Nitrate Nutrient	University of Arizona	93	AZR
Asghar Ali	Inheritance of Cold Tolerance and Economically Important Traits in Lentils	Colorado State University	93	AZR
Aslam Khan	Response of Hard Red Spring Wheat to Intensive Cereal Management Inputs	North Dakota State University	90	NAU
Atta Hussain Soomro	Seed Filling Period in Soybean	University of Kentucky	91	ART
Faqir Muhammad Anjum	Electrophoretic Identification and Technological Characterization of Pakistani Wheats	Kansas State University	91	UAF
Fateh Ullah Khan	Biological Control of Rhizoctonia	North Dakota State University	92	ARD
Fazle Subhan	Genotype X Environment Interactions in Soybeans	Oklahoma State University	94	CCR
Fida Mohammad	Breeding Wheat for Snow Mould Tolerance	University of Idaho	94	CCR

Notes: Year - Year doctorate received or to be received A - Employer or Record (See codes preceding)

	Doctoral Recipient	Doctoral Thesis Title	University Awarding Degree	Year	
18	Ghulam S. Shah	Interaction of Chinch Bug with New Resistance Grain Sorghum Lines and Hybrids and Some Prairie Grasses	Kansas State University	91	N
19	Gul Hassan	Differential Sensitivity of Italian Ryegrass and Rice Cultivars to Fenoxasprop	Oregon State University	92	A
20	Gulzar Ahmad	Influence of Soil Crusting on Emergence of Sugarbeet Seedling and Severity of Seed-Borne Diseases	University of Idaho	91	A
21	Hidayatur Rahman	Genotype X Environment Interaction for Fine Corn (Zea Maize L.) Populations Synthesized on the Basis of Seedling Root Morphology	South Dakota University	89	N
22	Isaac John	Isolation and Characterization of Root-Preferential cDNA Clones from Maize Roots	Iowa State University	91	N
23	Izhar Haq	Diagnostic Criteria of Sulfur Deficiency in French Prune (Prunus domestica 1.) Trees	University of California	92	A
24	Khalid Mahmood	Effects of the Variability of Rainfed Crop Production	Oklahoma State University	93	A
25	Khamiso K. Baloch	Cylindrocarpon Radiciola Associated With Root Rot of Cotton	Int'l Rice Research Institute	88	N
26	Kirmat Khan	Measurement and Evaluation of Tolerance to Cold Stress in Three Exotic Maize Composites From Different Areas of Pakistan	University of Nebraska	91	N
27	K. Bahadar Marwat	Interference of Common Cocklebur (Xanthium Strumarium L.) and Velvetleaf (Abutilon Theophrastic Medic) with Soybean Stands at Different Densities and Planting Patterns	University of Illinois	88	N
28	Mahmood Khan	Pathogenicity of Sclerotia-Forming Isolates of Colletotrichum Truncatum to Soybeans (Glycine Max) and the Effect of Soil Temperature on Root Infection	University of Illinois	91	N
29	Maqbool Akhtar	Competitic Analysis, Nitrogen Response and Canopy Cover Studies in Sugarcane Intercropping Systems	University of Hawaii	94	N
30	Masood Khan Khattak	Effect of "Neem Oil" on the Maize Weevil Sitophilus Zeamais and Its Parasitoid Anisopteramalus Calandrae	Kansas State University	94	
31	Mian Inayatullah	A Systematic Study of the Genus Vipio Latreille (Hymenoptera Braconidae) of the Nearctic and Nectropical Regions	University of Wyoming	92	N

Notes: Year – Year doctorate received or to be received A – Employer or Record (See codes preceding)

	Doctoral Recipient	Doctoral Thesis Title	University Awarding Degree	Year	A
2	Mirza Bargees Baig	Nitrogen Phosphorus Interaction and Role of Inhibitors	Utah State University	92	NAR
3	Mohammad Akram	Development of Herbicide Resistant Wheat Cultivars Through Tissue Culture Techniques	Washington State University	92	AAR
4	Mohammad Ali	Multivariate Analysis and Heterotic Effect Studies in Canola	Michigan State University	91	ORI
5	Mohammad Anwar Khan	Hybrid Barley in Hills Quality Study	Montana State University	91	AZR
6	Mohammad Aslam Hayat	Inheritance of Sawfly Resistance and its Correlation With Yield and Other Agronomic Traits in Spring Wheat	Iowa State University	93	BAC
7	Mohammad Azam Khan	Relationship between Energy Inputs and Crop Production in the Dera Ismail Khan District of Pakistan	Asian Institiute of Technology	93	GU
8	Mohammad Bashir Butt	Nitrogen Availability for Sugar Beets as Affected by Cropping System and Nitrogen Rate	Michigan State University	94	UAF
9	Mohammad Saleem	Physiochemical Stresses and Varietal Resistence in Rice: Effect on Whitebacked Planthopper, Sogatella furcifera (Horvath)	University of the Philippines	88	NAR
0	Mohammad Tahir	Effects of Gene Introgession in Cultivated Lentil from its Wild Relatives	Washington State University	90	NAR
1	Mohammad Umer Memon	Germination Control on Loblolly Pine Seed	Oklahoma State University	93	FDS
2	Mohammed Naeem	Selective Feeding on Green Bean Phaseolus Vulgaris by Heliothis Zea	University of Illinois	90	NAU
3	Muhammad Akhtar	Not Available	University of Arkansas	94	UAF
4	Muhammad Ashraf	Effect of Nitrogen and Water Stresses During Tillering and Grain-Filling in Wheat	Oregon State University	92	BAC
5	Muhammad Aslam	Distribution of Native and Labeled C14 Between Soil Aggregates and Particle Size Fractions	University of Missouri	92	NAR
6	Muhammad Maqbool	Characterization of Membrane Fatty Acids in Relation to Snapdragon Cut Flower Production Subjected to Elevated Root-Zone Temperatures	Mississippi State University	95	UAF
7	Muhammad Rafique Bhatti	Effect of Water Stress Conditions on N2-Fixation in Legume Tree Acacia Nilotica	Utah State University	93	UAF
8	Muhammad Rashid Ahmed	Effect of Sulphur Fertilization on Yield and Quality of Sorghum Forage	Virginia Polytechnic Institute	91	SWT

Notes: Year – Year doctorate received or to be received A – Employer or Record (See codes preceding)

	Doctoral Recipient	Doctoral Thesis Title	University Awarding Degree	Year	
49	Mumtaz Hussain	The Relationship Between Species Richness and Biomass of Plant Communities Emerging From Soil Seed Bank	Oklahoma State University	94	L
50	Mustajib Khan	Shattercane Control in Corn (Zea Mays L) and Corn Tolerance to Selected Soil Applied and Post Emergence Herbicides	Southern Illinois University	92	N
51	Nafees Sadiq Kissana	Genetic and Cultural Effects on Haploid Induction in Wheat	Colorado State University	91	N
52	Najeeb Uddin Siddiqui	Prediction of the Storage Viability of Corn Seeds in Relation to Seed Moisture Content, Temperature and Seed Vigor	Mississippi State University	92	F
53	Nasiruddin	Alternative Selection for Winter Wheat Improvement	Oklahoma State University	91	N
54	Nawab Ali	Regeneration and Germination of Cucumber Seeds in Vitro and a Study of Delayed Flowering Gene(df)	University of Illinois	90	N
55	Nazeer Hussain Shah	Responses of Wheat (Triticum Aestivum L) to Combined High Temperature and Drought or Osmotic Stresses During Maturation	Kansas State University	91	A
56	Noor Badshah	Studies on the Storage Life of Irradiated Potatoes of Different Maturities as Influenced by Different Levels of Fertilizer During Growth and Different Harvest Dates	Washington State University	89	N
57	Paignam Shah	Growth Curve Analysis of Soybean Cultivars	University of Illinois	88	N
58	Pervaiz Akbar Abbasi	Effect of Plant Genotype on Phytophthora Root Infection of Soybean	Ohio State University	94	D
59	Qadir Bux Baloch	Evaluation of Heterosis in F2 Hybrid Cotton for Seed and Seedling Characteristics and Yield	Mississippi State University	93	A
60	Qurban Ahmad	Energy Inputs and Crop Production	Asian Institute of Technology	93	U
61	Rab Dino Khuhro	Biological and Ecological Studies of Blissus Leucopterous (Say) at a Northeast Mississippi Locale	Mississippi State University	94	S
62	Rashid Ahmad	Charaterization of Physiological and Morphological Traits Related to Drought Tolerance in Wheat	University of Idaho	94	U
63	Saeed Ahmad	Soil K Level in Relation to K Treatment, Season of Year and Soil Moisture Level	University of Illinois	91	N
64	Sajjad Khan	Growth Analysis of the Effect of Row Width on Soybean	University of Illinois	94	P

Notes: Year - Year doctorate received or to be received A - Employer or Record (See codes preceding)

	Doctoral Recipient	Doctoral Thesis Title	University Awarding Degree	Year	A
65	Saleem Khan	Wheat Row Spacing Effects on Wild Date and Wheat Competition	University of Idaho	92	ARP
66	Samina Khalil	Mycorrhizae (VAM) of Soybean in Soil Toposequences and Mycorrhizal Dependency of Corn and Soybean Cultivars	Iowa State University	93	NAR
67	Shahid Iqbal	The Effects of Planting and Harvesting Dates on Soybean Seed Quality	Mississippi State University	94	FSC
68	Shahid Niaz	Cereal/Wheat Genetics and On-Farm and Experiment Station Research Methods and Management	University of Nebraska, Lincoln	93	WRI
69	Shakeel Ahmad Khan	Evaluation of various Apple Cultivars And Duarfin Roostock	Mississippi State University	93	UAF
70	Shaukat Mahmood	Effect of Alternative Nitrogen Fertilizer Management and Cropping System Strategies on Rainfed Spring Wheat Production	Montana State University	94	BAC
71	S. Asif Hussain Shah	Effect of Management Inputs on Production of Wheat in Rainfed Area of Louisiana	Alcorn State University	93	DAA
72	Tahir Aqil	Development in Vivo Assays for Studying Efficacy of Bicontrol Agents Against Cotton Seedlings Disease Complex Pathogens	Mississippi State University	94	ARI
73	Tayyab Jamil Ji	Evaluation of Seed Quality Among Awned and Awnless Wheat Cultivars	Mississippi State University	94	NSR
74	Waqar Ahmed	Movement of the Tobacco Mosaic Virus	Washington State University	91	AAR
75	Zahida Parveen	Localization and Identification of Position Effect Causing Sequences in GC-1 Transformations of Drosophila Melanogaster	Drexel University	94	UAF
76	Zahoor Swati	Mean and Variances of Early Generation Bulked Populations in Spring Wheat as Predictors of Derived Line Performance	South Dakota State University	88	NAU
77	Zar Qureshi	Resistance to Sunflower Rust and its Inheritance in Wild Helianthus Species	North Dakota State University	91	ARP
		ANIMAL SCIENCES			
78	Abdul Bari Punwar	A Review Of Various Diagnostic Tests Of Toxoplasmosis in Sheep and Goats	Oklahoma State University	91	SAU

Notes: Year - Year doctorate received or to be received A - Employer or Record (See codes preceding)

	Doctoral Recipient	Doctoral Thesis Title	University Awarding Degree	Year	
79	Abdul Rehman	Effect of Ensiling Leguminous Green Forage in Combination of Crop Residue with or without Microbial Inoculant on Fermentation, Chemical Composition, In Vitro Digestibility, Voluntary Intake and In Vivo Digestibility in Sheep	Virginia Polytechnic Institute	91	A
80	Anwar Saeed	Sertoli Cell Proliferation in Bull Testis	University of Illinois	94	C
81	Ejaz Ahmad	Use of Biodegradable Microspheres as Carriers of Antigen For Rodent	Colorado State University	94	N
82	Ghulam Muhammad	Staphylococci of Bovine Mammary Gland: Conventional and Molecular Dynamics of Infections, Plasmid Stability, Reproducibility, and Interspecific Conjugal Transfer of Antibiotic Resistance	Ohio State University	92	U
83	Iftikhar Ali	In Vivo and In Vitro Comparative Study on the Nutritive Value of High and Low Quality Forages Ensiled with Poultry Litter, Urea and Ammonia Treatments in Ruminants	Virginia Polytechnic Institute	91	L
84	Iftikhar Hussain	Detection and Control of Hemorrhagic Enteritis Virus of Turkeys	University of Minnesota	93	U
85	Imdad Hussain Mirza	Utilization Of Low-Quality Roughages, Agro-Industrial Wastes and By-Products In Animal Feeding	Oregon State University	93	N
86	Irshad-Ul-Haq	The Role of Insulin and Insulin Related Factors on Lipoprotein Utilization by Bovine Luteal Cells	Ohio State University	92	C
87	Javed Rashid	Cellular and Molecular Mechanisms in Pneumenic Pasteurellosis	University of Minnesota	94	C
88	Kanwar Nasir M. Khan	Studies on Bone Marrow Micro-Environment in Feline Leukemia	Ohio State University	92	A
89	Makhdoom Abdul Jabbar	Intake of Indigestible NDF (neutral detergent fiber)	Cornell University	91	L
90	Manzoor Hussain	Recognition of Paramyxovirus Antigens by Lambs	Iowa State University	92	N
91	Mohammad Aslam	Effect of Sodium Bicarbonate on Rumen Acidbase Milieu in Dairy Cows	Oklahoma State University	91	U
92	Mohammad Nawaz	Genetic and Environmental Variation in Production Components of Purebred and Crossbred Ewes	Oregon State University	91	N
93	Muhammad Amjed	Attempts to Improve Sugarcane Bagasse & Pith as Energy Sources for Ruminant Animals	University of Minnesota	90	N

Notes: Year – Year doctorate received or to be received A – Employer or Record (See codes preceding)

	Doctoral Recipient	Doctoral Thesis Title	University Awarding Degree	Year	A
94	Muhammad Ashraf	Formulation of Functional Diets for Larval Fish	University of Rhode Island	92	FDP
95	Muhammad Ayub	Factors Affecting Exchange of Phosphate Between Soil and Water in Ponds	Auburn University	92	FDP
96	Muhammed Aleem Bhatti	Changes in Hormone Secretion and Follicular Development in Postpartum Cows	Pennsylvania State University	93	CVS
97	Muhammad Mushtaq	Effects of Gossypol on Reproductive Functions in Young Bulls	Ohio State Universsity	94	LPR
98	Munir Ahmad	Econometric Analysis of Output Growth Using Panel Data: the Case of Vermont Dairy Farm	University of Connecticut	94	UAF
99	Muhammad Sarwar	Evaluation of Corn Gluten Feed and Soyhulls as Fiber and Concentrate Sources in Dairy Diets	Ohio State University	91	WRI
100	Mumtaz Ahmad Khan	Isoloation and characterization of Mycoplasma ovipneumoniae from pneumonic lambs	Iowa State University	93	UAF
101	Mushtaq Mian	Nutritional Evaluation of Soybean Meal Varying in Urease and Trypsin Inhibitor Activity	South Dakota State University	88	NAU
102	M. Shahbaz Bhatti	Solubilization of Wheat Bran Dietary Fiber	North Dakota State University	92	BAC
103	Naeem Ullah Khan	Oxytocin in Oviduct Contractility: Implication for Increasing Animal Fertility	University of Illinois	94	CVS
104	Najib Ur Rehman	Various Aspects of In-vitro Fertilization in Bovine	Washington State University	93	UAF
105	Shakeel Babar	Characterization of Adenovirus Isolated From Sheep	Oregon State University	94	VRI
106	Shaukat Ali Bhatti	Factors affecting intake and Digestion of forages by ruminants	Ohio State University	93	LDD
107	Sohail Akhtar	Influence of Supplementation of Winter Performance, Forage Utilization and Digesta Kinetics of Beef Cows	Colorado State University	93	NAU
108	Syed Masoom Shah	Immunoelectron Microscopic Studies on the Pathogenesis of Infectious Bursal Disease Viruses in Chickens at Different Ages	Auburn University	93	VRI
109	Syed Mirajuddin	Inheritance & Incidence of Atresia Coli in Holstein cattle	University of Illinois	90	NAU
110	S. M. Imtiaz Hussain	Estrous Cyclicity in Nonlactating and Lactating Holsteins and Jerseys during summer in Pakistan	Mississippi State University	91	LES
111	Taj Mohammad Khan	Effect on Supplemental Methionine on Wool Growth	University of Wyoming	89	NAU

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	Doctoral Recipient	Doctoral Thesis Title	University Awarding Degree	Year	A
112	Talat Naseer Pasha	Yield, Nutritive Value and Kinetics Of Digestion Of Forages in Ruminants: Effects of Length of Intensive Feeding Period on Growth, Feed Utilization and Carcass Characteristics of Three Goat Breeds of Pakistan	West Virginia University	92	U
113	Zia-Ur-Rehman	Physiological and Morphological Maturation of the Chicken Pituitary	Univesity of Arizona	91	U
		NATURAL RESOURCES			
114	Abdul Wahid	Fecal Microhistological Analysis of the Rangeland Diet	Oregon State University	90	P
115	Amjad Tahir Virk	Balancing Wildlife Conservation with Local Economic Development: A Comparison of Community Based Conservation Projects in Pakistan	University of Montana	93	F
116	Babur Ejaz	A Model Environmental Policy Plan for Pakistan	Colorado State University	93	F
117	Ghulam Akbar	Microenvironmental Effects of Dungpat on Germination and Establishment of Range Forest Species	Utah State University	94	A
118	Ghulam Rasool Keerio	Acacia nilotica Hurry Agroforestry System: Effect on Soil Properties	University of Idaho	93	F
119	Ghulam Sarwar Khan	Effect of Trees on Cultivated Crops in Pakistan	University of Idaho	93	U
120	Irshad Ahmad Amir	Effect of Salinity on Nitrogen Fixation of Shisham Seedlings	Utah State University	89	F
121	Mohammad Iqbal Sial	Diameter Distribution and Yield of Even-aged Natural Stands of Pinus duragensis	Colorado State University	89	F
122	Nasim Javed	Effects to Tree Removal and Slash Disposal on Hydrologic Properties and Understory Species Composition of a Pinyon Juniper Woodland Site in Gila National Forest in New Mexico	New Mexico State University	91	F
123	Sarwat Naz Mirza	Diet Selection Behavior in Sheep	Utah State Univesity	91	NA
124	Shafiqur Rehman Khan	Effects of Induced Environmental and Physiological Stress on Physiology and Performance of Pacific North West Conifer Species	Oregon State University	94	F
125	Sheikh Suleman	Efficiency of Rain Water Harvesting Stystem for the Development of Arid and Semi Arid Rangelands of Pakistan	New Mexico State University	92	F

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	Doctoral Recipient	Doctoral Thesis Title	University Awarding Degree	Year	A
		WATER RESOURCES			
126	Abdul Majeed	Using Poor Quality Irrigation Waters for Crop Production: a Computer Model for Management Strategies	Washington State University	92	PCR
127	Ata Ur Rehman Tariq	Hydraulic Characterics and Drainage Analysis of Swelling Clay Soils	Colorado State University	92	UET
128	Aurang Zeb	Long Term effects of Changes in Vegetation Condition, Precipitation and Watershed Parameters on Low Flows in Semi-Arid Pacific Northwest	Oregon State University	93	PFI
129	Bagh Ali Shahid	Modifying Lacey's Regime Theory for the Design of Alluvial Canal System	University of Idaho	90	IMI
130	Behrulal T. Devrajani	Management of Irrigation Drain Systems for Salt Balance (Solids Transport in Saline and Waterlogged Soils)	Iowa State University	93	SAU
131	Haq Nawaz Shah	Economic Analysis of Groundwater Development Policy in Pakistan	Kansas State University	95	ERI
132	Mansoor A. Hashmi	A Spatial Methodology for Estimation of Crop Water Requirements - the GIS Approach	Colorado State University	93	NSK
133	Mohamad Siddique	Mathematical Modelling of Reservoir Sedimentation Buildup	George Washington University	91	WAP
134	Mohamed Saffar Mirjat	Water Table Management Effects on Photosynthesis, Chlophyll, Yield and Water Quality	Iowa State University	94	SAU
135	Mohammad Younus	Modelling of Flood Plain Flows	Washington State University	93	UET
136	Mohammad Yousaf	The Effect of Irrigation Technologies On Solute Transport	University of Arizona	94	NAR
137	Muhammad Aslam	Large Area Salinity Management Modeling	Utah State University	93	UAF
138	Muhammad Iqbal	Optimal Design of Level Basin Irrigation Systems	Colorado State University	93	UAF
139	M. Akram Kahlown	The Effect of Aquifer and Fluid Parameters, Long Term Pumping Patterns with Recharge, Multiple Well Systems, Thickness and Location of Clay Layer, and Well Parameters on the Transport of Saline and Fresh Water to Wells	University of Idaho	92	WAP
140	Niaz Ahmad	Monitoring High Water Table Effects on Corn Growth and Water Quality in Growth Chambers and Field Lysimeters	Iowa State University	91	UAF

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	Doctoral Recipient	Doctoral Thesis Title	University Awarding Degree	Year	A
141	Shakeel A. Khan	Engineering for Development of Major Water Resources Projects in Developing Countries	Colorado State University	89	NS
142	Zahid Mahmood	Development and Use of a Laboratory Apparatus to Study the Effect of Soil Texture, Crop History, and Water Potential on Soil Loss	Iowa State University	92	UE
		SOCIAL SCIENCES			
143	Abdul S. Memon	The Impact of Agrarian Reform on Production Efficiency and Income Distribution in the Agricultural Sector of Pakistan	Texas Tech University	93	DA
144	Abida Taherani	Socio-Economic and Environment Evaluation of LBOD Project in Sind	Colorado State University	94	SA
145	Ahmed Masood Khalid	Ricardo/Barrow Neutrality Theory	Johns Hopkins University	91	AI
146	Ajmal Hyder Shah	Economic Analysis of Seed Industry Transportation Systems in Punjab	Texas Technical University	93	PS
147	Asmatullah Khan	Farmer's Resource Status and Information Availability and Utilization	University of Illinois	88	NA
148	Ejaz Ghani	Commodity Price Stabilization	University of Nebraska	94	PI
149	Ikram Saeed	An Integrative Instructional Systems Perspective for Managing Conflict over the Public Rangeland Grazing Rights of Oregon Cattlemen	Oregon State University	93	NI
150	Mohammad Abdul Quddus	An Agricultural Sector Model Approach to Analysis of the Livestock Economy of Pakistan.	Colorado State University	93	PA
151	Mohammad Asrar	Perceptions and Preferences on Institutional Decision Making of the faculty of North-West Frontier Province Agricultural University, Peshawar	University of Illinois	90	NA
152	Mohammad Idris	Family Influence on Utilization of Remittances: A Case Study of a Village in NWFP Pakistan	University of Illinois	91	NA
153	Muhammad Ramzan Akhtar	The Determinants of Regional Fertilizer Demand and Supply Functions in the U.S.	University of Minnesota	93	PA
154	Muhammad Umar Mallah	Professional Competencies Needed by Agriculture Teachers in Hyderabad Division, Sindh, Pakistan	Iowa State University	91	SA
155	Muzaffar Iqbal Bhatti	An Economic Analysis of Public Land Use and its Implications on the Livestock Ranch Values in the Selected Areas of Eastern Oregon	Oregon State University	93	PA

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	Doctoral Recipient	Doctoral Thesis Title	University Awarding Degree	Year	A
5	Parvez I. Paracha	Effect of Iron Supplementation on Preadolescent School Girls in North West Frontier Province (NWFP) Pakistan	University of Connecticut	90	NAU
7	Sarfraz Ahmad	Income Potential and Stability of Diversified Tennessee Farms With Emphasis on Woody Landscape Plants As Alternative Enterprises	University of Tennessee	94	BAC
8	Shabnam Bahar Malik	Gender-Bias in Agricultural Technologies	Cornell Unviersity	93	PAR
9	Shahid Mahmood Zia	Microcomputer Applications in Agricultural Development	Oklahoma State University	92	NAR
0	Tanvir Ali	Identification of Job Performance: Competencies of Agriculture Extension of Field Assistants in Faisalabad District	University of Minnesota	91	UAF
1	Tariq Masood Khan	Not Available	University of Kentucky	94	DAA
2	Waqar Ahmed Jehangir	Size Productivity Relationship in Pakistan's Agriculture	Colorado State University	93	NAR
3	Zulfiqar Ahmed Gill	Economic Welfare Aspects of Agricultural Development Policies in Pakistan	Colorado State University	93	UAF
		FOOD SCIENCE			
4	Ghulam Mohyuddin	The Analysis of Hydrolytic Rancidity In Dairy Products With Supercritical Extraction and Chromatography	University of Illinois	93	UAF
5	Khalid Iqbal	Recovery of Sugars from Cane Molasses by Continuous Simulated Moving Bed Ion-Exclusion Chromatography	Louisana State University	91	LSM
6	Mohammad Haroon Baloch	Preparation and Evaluation of a Jerky-Type Snack Food Composed of Mutton and Partially Defatted Chopped Beef (PBCB) Using High-Temperature, Short-Time (HTST) Food Extruder	New Mexico State University	94	SAU
7	Mohammad Sabir Ali	Detection, Enumeration and Identification of Clostridium Perfringens (a Bacterial Food Pathogen)	Kansas State Univesity	91	CPC
8	Muhammad Sarwar	Determination of Farina in Semolina and Pasta Dried at Low and High Temperatures	North Dakota State University	92	LDD
9	Rafiullah Khan	Development and Processing of Intermediate Moisture, Shelf-Stable Condensed Sweetened Soy Concentrates	University of Illinois	89	NAU

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	Doctoral Recipient	Doctoral Thesis Title	University Awarding Degree	Year
		MISCELLANEOUS		
170	Abdul Aziz Sabir	Numeric Foundational Exam	University of Lexington	94
171	Javed Niaz	The Calibration of Thermoluminescence Dosimetry Arrays	Washington State University	93
172	Syed Rehan A Hussain	Cloning And Characterization of Mouse Acidic FGF Gene	Ohio State University	94

Notes: Year – Year doctorate received or to be received A – Employer or Record (See codes preceding)

Annex
References

Author/Publisher	Title	Date
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Upreti Bedh P.	Follow-Up/Evaluation of the 1986 and 1987 MINFAC/USAID Private Sector Agribusiness Training Program	1989
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Women's Coordination Cell P&D Dept.	Women's Development Programmes in Balochistan	
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Wright, Bill C.	Management of Agricultural Research and Technology (MART): Final Report	1993

FACTS

In Pakistan, agriculture and agribusiness account for more than half of gross domestic product and 70% of employment.

Since 1980, the governments of Pakistan and the United States have cooperatively invested close to $1b (Rs 30,00,00,00,000) in agriculture and rural development in Pakistan.

Education and training beneficiaries of Pak-US cooperation in agriculture and rural development during the period 1984-1993 include:

154 Doctoral Recipients
231 Master's Recipients
165 In-Training Master's and Doctoral Candidates
1650 Short-term Overseas Trainees
10,000 Short-term In-Country Trainees

QUOTES *from training beneficiaries*

" *As a result of the adoption of cultural methods of pest control learned through USAID-supported training, Rs. 1.7b [US$ 60m] in savings and increased yield value have been realized in local sugarcane production.* "

" *The seed industry in Pakistan, both public and private, has benefitted from innovations traceable to our training as a group in the United States.* "

" *Some simple packaging and quality control techniques I observed during training are already being incorporated in our operations for immediate improvement of our product quality.* "

" *Training has given me confidence to make decisions and broadened my professional perspective.* "

" *On the whole, USAID-supported training programs are of great importance; they expand and broaden the educational and technical skills of participants and place them on an international scale.* "